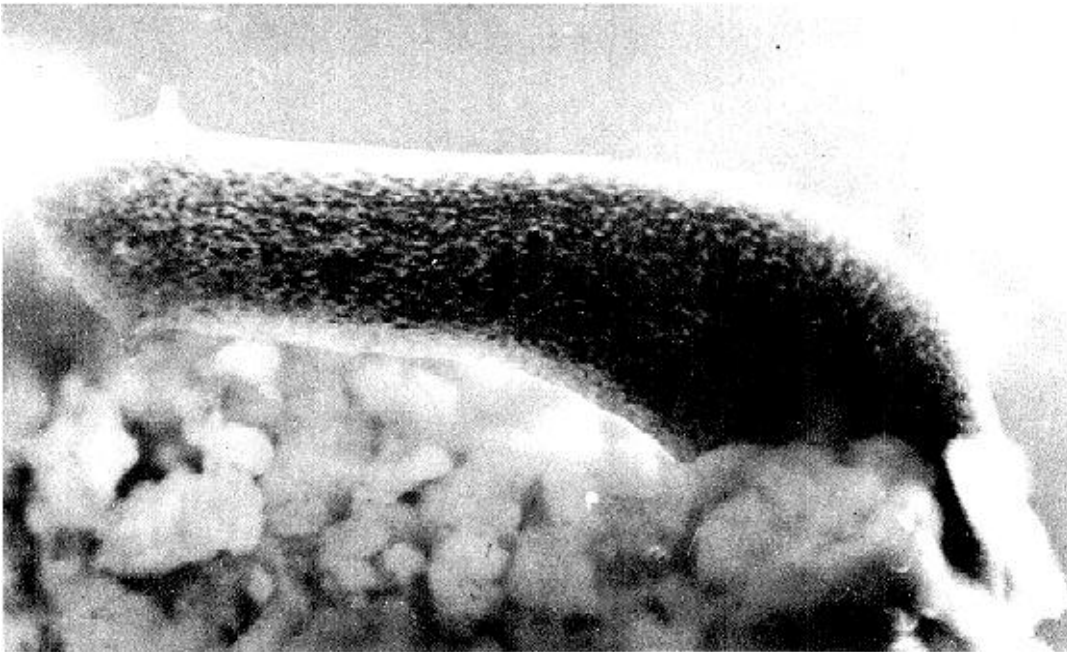


1973 ANNUAL ISSUE

CREATION RESEARCH SOCIETY QUARTERLY



Haec credimus:

For in six days the Lord made heaven and earth,
the sea, and all that in them is and rested on the
seventh. — Exodus 20:11

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EDITORIAL NOTE

In this month's issue the editors have attempted to follow two different themes, the first of which is "Genetic Engineering." Recently there has been a scientific "craze" regarding man's attempt to design his own gene systems and re-work his heredity. In keeping with this theme, Dr. Duane Gish and Professor Harold Armstrong present fascinating critical articles. Then, as a second theme, we thought that creationist literature (in *C. R. S. Quarterly* and elsewhere) might become inaccessible or unknown to new researchers and authors. Because of this, the reader will find several helpful review articles in which the author has sought to introduce newer members of *C. R. S.* to much of the work that has been done by creationists in such major areas as glaciology, thermodynamics, and general studies. Thus, articles by Professor Telfair, Professor Mulfinger, and Rev. Springstead should be of great help. Other articles, both research and review in nature, complete an issue packed with information in support of Biblical creationism; and, the editorial staff thanks each author for his part in this significant effort.

We are pleased to note that the tenth year of publication of the *Creation Research Society Quarterly* begins with this issue.

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COVER ILLUSTRATION

A common invertebrate animal is shown—the planarian or "flatworm." Flatworms feed on many materials. The flatworm pictured was feeding on liver by means of its pharynx (far right). Its head end with eyes is at the left. In a research article, in this issue, E. N. Smith discusses the amazing powers of "population control" resident in the simple flatworm. He considers, also, what such powers may mean in keeping with a Biblical view of the "fall" and overpopulation. Photography by Richard Lund.

CROWDING AND ASEXUAL REPRODUCTION OF THE PLANARIA, DUGESIA DOROTOCEPHALA

E. N. SMITH*

Crowding clearly reduces the fissioning rate of the planaria, Dugesia dorotocephala. This reduction seems to be the result of some water soluble substance and is not the result of slime, oxygen depletion, or carbon dioxide increase. At densities below 2.0 planaria per 100 ml. of water, reproduction is not affected by crowding. If planaria do not reproduce at their maximum rate all the time, but only reproduce to replace losses, then the effect of intraspecific competition and natural selection is reduced. Supposedly, without natural selection there would have been no evolution. If planaria living today in a protected environment can turn their reproduction off when a certain maximum but healthy density is reached; then it is quite conceivable that in the perfect creation before the Fall these animals could regulate their own numbers without the necessity of outside predation, starvation or disease.

Introduction

With regards to the regulation of animal numbers two possibilities exist: The individual may reproduce maximally near its physiological limit with the population density being regulated by negative outside forces. Or, alternately, the individual may in some way influence its own recruitment rate and maintain some form of density homeostasis.

Evolutionists have generally taken the former view with natural selection always favoring the individual or genotype that can leave the most reproducing progeny.^{1,2} Competition between too many offspring is thought to be the "directing" force of evolution. Without an excess of offspring there would be no competition, no natural selection, and no evolution.³ Creationists should find the alternate view more acceptable.

Population Control Before the Fall

The original creation was good, complete, and not lacking in any aspects. The phrase, "And God saw that it was good," appears seven times in the first chapter of Genesis⁴ and refers to the things God created. Verses 21 and 25 refer specifically to the animal kingdom, and verse 31 summarizes God's opinion of the things that He had willed into existence, "and God saw everything He had made, and behold, it was very good. . . ." Certainly an all wise Creator would not have called something good if it contained errors or inadequacies. In addition, Gen. 2:1 states, "Thus the heavens and the earth were finished, and all of the host of them," emphasizing again the idea of a fully functioning and complete world.

Implied in the teaching of a perfect creation is the concept of a deathless creation; no starvation, disease or predation. Only after sin entered into the newly created world did predation and death appear. Consider the argument by Whitcomb and Morris:

One of the clearest texts in the Old Testament on the transformation of animal charac-

teristics after the Fall is that which describes the diet which God ordained for animals before the Fall. Before the Edenic curse, this was God's provision for the food of animals: "to every beast of the earth, and to every bird of the heavens, and to every thing that creepeth upon the earth, wherein is life, *I have given every green herb for food*: and it was so" (Gen. 1:30). Under such conditions, there could have been no carnivorous beasts on earth before the Fall; for the animals to which God gave "every green herb for food" included "every beast of the field" and "everything that creepeth upon the earth, wherein is life."⁵ (Emphasis added)

This is in direct contrast to the conditions described after the Fall immediately following the Flood:

And the fear of you and the dread of you shall be upon every beast of the earth, and upon every fowl of the air, upon all that moveth upon the earth, and upon all the fishes of the sea; into your hand are they delivered. Every moving thing that liveth shall be meat for you; even as the green herb have I given you all things.⁶

If a great span of time separated the Creation from the Fall, or if Adam and Eve had not sinned, what would have kept the population of the many herbivore animals in check? Without predators would the rodents soon have destroyed God's "good" and "finished" work? Of course not. Inside each animal was a mechanism for regulating its own population.

Immediately following Creation in response to God's command to "Be fruitful and multiply,"⁷ "fill the waters,"⁸ and "replenish the earth"⁹ all animals would have reproduced at a very high rate, probably near their physiological limits. After a while (a short time for highly fecundant forms, longer for others) the earth would have been filled. In order to avoid overpopulation and consequent destruction of the newly created world, reproduction had to drop to zero. All

*E. N. Smith holds the M.S. degree in biology.

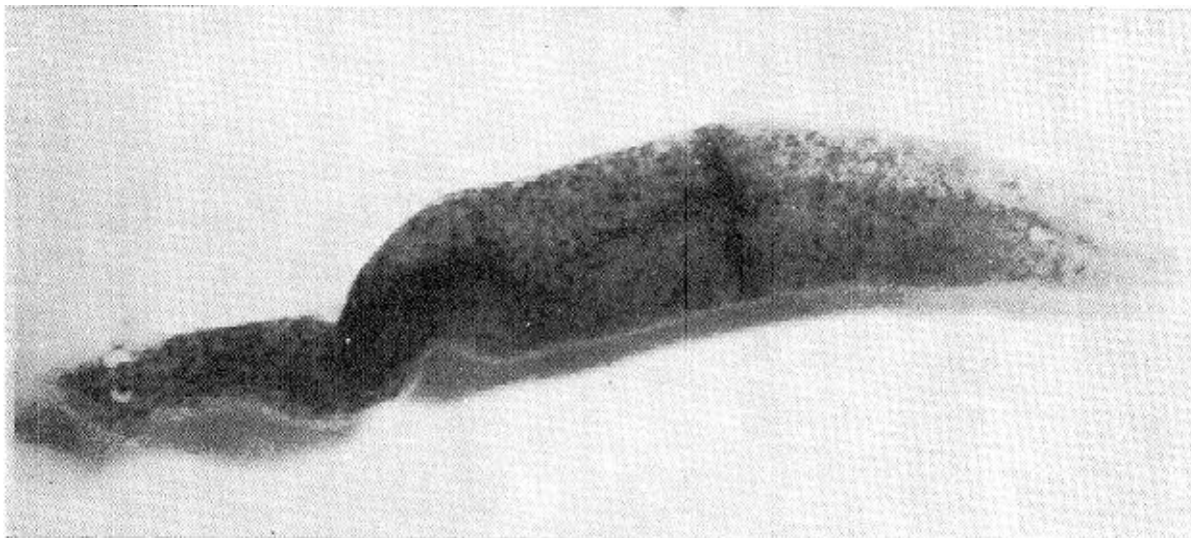


Figure 1. Flatworm reproduction. The flatworm photographed here has begun to attach itself to the substrate at two points (note two lines, or darkened regions, across its body near midpoint). By means of each attachment, the flatworm pulls itself apart and produces two new worms by a kind of asexual reproduction. Photography by Richard Lund.

animals must have had a built-in mechanism for controlling their reproductive rates. The command was to fill the earth not to reproduce at the highest rate possible indefinitely.

Population Control Today

The paradise did not last. Sin entered into the world and because of sin the Curse. This curse was not limited to the Serpent and Adam and Eve, but to the entire created world. "Cursed is the ground for thy sake; in toil shalt thou eat of it all the days of thy life; thorns also and thistles shall it bring forth to thee; and thou shalt eat the herb of the field; in sweat of thy face shalt thou eat bread, till thou return unto the ground. . . ." ¹⁰ The New Testament teaches that this fallen state still exists for the entire world. "For we know that the whole creation groaneth and travaileth in pain until now." ¹¹

The Fall certainly brought about modifications to the living world. Animals began to prey upon one another. Death, fear, and disease entered into the world but the Fall and Curse do not imply a re-creation. If animals were created with the ability to regulate their own numbers, it is only logical that they still retain that ability. Woman's curse, in part, was increased pain in child birth, not a new mode of reproduction. ¹²

It appears that two truths are evident from the Scripture concerning the regulation of animal numbers :

(1) A perfect creation prior to the Fall would necessitate animals capable of limiting their own rates of reproduction; and,

(2) This mechanism may be working today, perhaps partly masked by other consequences of

the Edenic Curse, which include predation, disease, and starvation.

For animals living today it is also logical to look for an intrinsic mechanism for the regulation of numbers. Man has discovered (often too late) that the maximum harvest of any renewable resource can increase to a point where increased effort results in diminishing returns. To avoid over kill (with possible irreversible damage to the environment or species), countries have set limits as to the number of individuals (fish, whales, or game) that can be annually harvested. Only by this method can the maximum sustainable harvest be maintained.

Animals in their natural environment face the very same problem. Whether carnivore or herbivore the problem remains the same; unlimited reproduction results in over exploitation of the food supply.

V. C. Wynne-Edwards ^{13,14} has proposed the theory that animal numbers are regulated from within, not by the traditional population checks (predation, disease, and starvation) that Darwin advanced. He proposed that the individuals of a population regulate their own recruitment rate, and has amassed great support of his theory from mammals, birds, and insects.

The fresh water planaris, *Dugesia dorotocephala*, might offer a method of testing a portion of Wynne-Edwards hypothesis. The planaria is easily kept in the laboratory, reproduces asexually, and its fissioning rate is known to be inversely related to density. ¹⁵ In fissioning the posterior region clings tightly to the substrate, and the anterior portion crawls away causing the

two ends to break apart. Each fission fragment regenerates the appropriate missing part to produce two complete worms. No morphologically differentiated plane of fracture has been observed.

The purpose of this study was to attempt to determine what consequences of crowding reduce fissioning.

Materials and Methods

Three separate groups of planaria were used in this study. The first group was collected from a small stream in Red Rock Canyon State Park, Hinton, Oklahoma, in the fall of 1968. About 30 individuals were collected and kept until May, 1969, when the study was initiated.

The second group (36 animals) was collected June 9, 1969, at the Wichita Mountain Wildlife Refuge, Oklahoma.

The third group (80 animals) was collected from Red Rock Canyon State Park, Hinton, Oklahoma, on January 13, 1972 and was maintained at Baylor University under conditions of constant ($20 \pm 1.0^\circ\text{C}$) temperature and a twelve hour photoperiod (centered at 12:00 noon, Central Standard Time).

In order to measure quantitatively the effects of crowding on the rate of fissioning the planaria were kept in identical containers. Different densities of planaria were kept in each container; that is, in any one experiment one worm was kept in one container, two worms in another identical container and so on.

In each of the following experiments the worms were fed beef liver twice weekly. They were allowed to feed for two hours (during which time most worms had gorged themselves and crawled off the meat). The meat then was removed. The water was changed twice and any daughter fragments counted and removed, thereby maintaining each container of worms at the starting density throughout the experiment. Only aged aerated tap water was used and only large (12-15 mm), active animals were used.

Experiment 1

The first experiment consisted of 24 planaria from the first group in five identical $4\frac{3}{4}$ oz. glass jars. Each jar contained 10 ml of water. No aeration was used and the experiment lasted 64 days. The 24 planaria were distributed as follows: 1, 2, 4, 7, and 10 per jar.

The experiment was conducted in a basement with a temperature of $21^\circ\text{C} \pm 1^\circ\text{C}$. Except for the days the worms were fed and counted, they were kept in darkness.

Experiment 2

The second experiment consisted of 25 worms from the second group. Six $4\frac{3}{4}$ oz. glass jars were again used, each with 10 ml of water. The planaria were distributed as follows: 1, 2, 3, 4,

6, and 9 planaria per jar. Again the temperature was $21^\circ\text{C} \pm 1^\circ\text{C}$ with no light. This experiment was run for 45 days. Again no aeration was used.

Experiment 3

The third experiment was conducted at Baylor University. Thirty-eight worms from the third group were used and the containers with the smaller numbers were repeated to minimize the effects of genetic variation of fissioning rate in the small sample sizes. Ten ml of water was used in each container. Eight plastic shell vials (3 cm diameter) each containing 10 ml of water were used. The planaria were distributed as follows: 1, 1, 2, 2, 4, 4, 8, and 16 per vial. No aeration was used and the experiment was run for 57 days.

In this experiment, and each of the following, the temperature was $20^\circ\text{C} \pm 1^\circ\text{C}$ with a twelve hour photoperiod centered at 12:00 noon Central Standard Time.

Experiment 4

The fourth experiment, lasting 34 days, included eight plastic vials and 38 planaria from the third group. Again low density vials were repeated. In this experiment aeration was used in each vial by introducing a chain of bubbles from a small capillary tube placed below the water level in each vial. The air was "scrubbed" by first letting it bubble through a one liter flask of distilled water. The planaria were distributed as follows: 1, 1, 2, 2, 4, 4, 8, and 16 per vial.

Experiment 5

The fifth experiment included 31 planaria from group 3 and, instead of impervious containers, the planaria were enclosed in a small mesh cloth bag of about 10 ml capacity. The small bags were then suspended in a one liter container of water. The bag kept the planaria captive but allowed water to freely pass in and out. Planaria were distributed as follows: 1, 2, 4, 8, and 16 per bag. The experiment was conducted for 31 days. No aeration was used.

Experiment 6

The sixth experiment was conducted for 34 days. Sixty-three animals were used in six glass jars ($4\frac{3}{4}$ oz.). One hundred ml of water was placed in each jar. Planaria were distributed as follows: 1, 2, 4, 8, 16, and 32 per jar. No aeration was used.

Results of Experiments

Table 1 represents data from experiment 3 and may be used as an example of how the data were collected and used to prepare the graphs. Twice each week when the animals were fed the asexually reproduced progeny (daughter fragments) were removed from their respective containers and counted. At the end of the experiment the total for each container was recorded as the total

number of fragments per container. The day column simply represents the range of days during which the worms in a particular jar may have reproduced. Since the worms were observed only twice each week the exact day of fissioning was not known.

The total number of fragments in each jar was divided by the number of worms in that jar (this number remains the same for the duration of the experiment since any daughter fragments are removed twice weekly). This gave the number of fragments produced per worm for the different densities. Since the different experiments did not all last for the same duration it was then necessary to divide the number of fragments per worm by the total number of days the experiment was conducted. This gave the number of fragments per worm per day and the results of the various experiments were compared. Since the rate of asexual reproduction changed by almost threefold it was necessary to plot it on a logarithmic scale to avoid crowding.

The density is expressed in planaria per 100 ml of water. Since experiments 1 thru 5 were conducted in only 10 ml of water the densities (per 10 ml) were multiplied by 10 and expressed as density per 100 ml of water. This facilitated comparison of all of the experiments. The volume of water used in each experiment (and not just the density) should be kept in mind however as it no doubt affected the results.

In Table 1 notice especially the apparent synchrony with which both of the planaria in jar 3 and both the planaria in jar 4 reproduced.

Table 2 is a summary of the results of all six experiments.

Figures 2 thru 7 represent graphically the results of experiments 1 thru 6 respectively.

Discussion

Only limited work has been done with fissioning rates in the planaria as a function of crowding. Best, *et. al.*¹⁶ found that reduced population densities lead to increased fragmentation rates and concluded that, "In the presence of other planarians, the brain exerts an influence (probably neurohormonal) to suppress fissioning." They felt that the functional significance of this reduction in fragmentation rate by the brain was part of a population density "feedback control system for adjusting the rate of reproduction to population density."

Results of this study verify the conclusions of Best, *et. al.* in that increased crowding reduced fissioning rate. The effect is best seen in Figures 2, 3, 4, and 5 where only 10 ml of water was used. The same result is apparent, however, in Figures 6 and 7 as well. It appears certain that some consequence of crowding inhibits fissioning. Possible factors might be: 1) increased anti-

TABLE 1
FISSIONING FRAGMENTS FROM
EXPERIMENT 3

Jar Number	1	2	3	4	5	6	7	8
Planaria/Jar	1	1	2	2	4	4	8	16
OCCURANCE OF FRAGMENTS								
DAY								
0 - 2	0	1	0	0	0	1	1	0
3 - 6	1	0	2	2	1	1	1	0
7 - 9	0	1	0	0	0	1	0	1
10 - 13	1	0	0	0	1	0	0	0
14 - 16	0	0	0	0	1	0	0	0
17 - 20	0	1	2	0	0	1	1	0
21 - 23	1	0	0	0	0	0	0	0
24 - 27	0	1	0	2	0	1	0	0
28 - 30	0	0	0	0	0	2	0	0
31 - 34	1	0	2	0	0	0	0	0
35 - 37	0	1	0	0	0	0	0	0
38 - 41	0	0	0	0	1	0	0	0
42 - 43	0	0	0	0	0	0	0	0
44 - 47	0	1	0	0	0	0	2	0
48 - 50	0	0	0	1	0	2	0	0
51 - 54	1	0	0	1	1	2	2	0
55 - 57	0	1	2	0	0	0	0	2
Total								
Fragments	5	7	8	6	5	11	7	3
Fragments/Planaria/								
57 days	5	7	4	3	1.25	2.75	0.875	0.1875
Fragments/Planaria/								
day	0.088	0.12	0.070	0.053	0.022	0.048	0.015	0.0033

metabolite concentration resulting from crowding (such as NH_3 or CO_2). 2) Some density dependent, planarian produced, inhibitor (such as slime or some "neurohormonal" substance. (3) A neural response to planaria-meeting-planaria, or 4) the depletion of some metabolite such as oxygen.

It would seem likely that depletion of oxygen or carbon dioxide build-up could be limiting under high density conditions. This is plausible since after each feeding the planaria in the crowded containers would be found clinging to the surface film at the top of the water.

Experiment 4 was designed to test the effect of the depletion of oxygen or the build-up of carbon dioxide (or any other volatile metabolite). Aeration maintained dissolved oxygen at saturation and removal of soluble volatile metabolites. Instead of decreasing the effect of crowding, it was exaggerated (Figure 5). Although 16 planaria were started in one vial (16 planaria survived in 10 ml of water in experiment 3), after three days they began to break up. By the ninth day the pieces were dead. Increased oxygen and removal of volatile wastes clearly did not decrease inhibition associated with crowding.

The planaria's life history reveals that lack of oxygen is probably not a limiting factor. Planaria are found under rocks in slow moving water, and deep in the mud below a stream, where dissolved oxygen is well below saturation.

It would appear that inhibition is not the result of oxygen depletion of volatile metabolite

TABLE 2
SUMMARY OF EXPERIMENTAL RESULTS

Experiment 1: 10 ml, no aeration, 64 days									
Jar number	1	2	3	4	5				
Quantity planaria	1	2	4	7	10				
Total fragments	5	6	9	7	1				
Fragments/planaria	5	3	2.25	1.0	0.1				
Fragments/planaria/day	.078	.047	.035	.016	.0016				
Experiment 2: 10 ml, no aeration, 45 days									
Jar number	1	2	3	4	5	6			
Quantity planaria	1	2	3	4	6	9			
Total fragments	2	0	4	2	1	1			
Fragments/planaria	2	0	1.3	0.5	0.167	0.111			
Fragments/planaria/day	.044	0	0.030	.011	.0037	.0025			
Experiment 3: 10 ml, no aeration, 57 days									
Vial number	1	2	3	4	5	6	7	8	
Quantity planaria	1	1	2	2	4	4	8	16	
Total fragments	5	7	8	6	5	11	7	3	
Fragments/planaria	5	7	4	3	1.25	2.75	.0875	.1875	
Fragments/planaria/day	.088	.12	.070	.053	.022	.048	.015	.0033	
Experiment 4: 10 ml, aeration, 34 days									
Vial number	1	2	3	4	5	6	7	8	
Quantity planaria	1	1	2	2	4	4	8	16	
Total fragments	4	4	5	4	1	1	1	—	
Fragments/planaria	4	4	2.5	2	.25	.25	.125	—	
Fragments/planaria/day	.12	.12	.074	.059	.0074	.0074	.0037	—	
Experiment 5: approx. 10 ml (see text), no aeration, 31 days									
Bag number	1	2	3	4	5				
Quantity planaria	1	2	4	8	16				
Total fragments	3	6	6	10	20				
Fragments/planaria	3	3	1.5	1.25	1.25				
Fragments/planaria/day	.097	.097	.048	.040	.040				
Experiment 6: 100 ml, no aeration, 34 days									
Jar number	1	2	3	4	5	6			
Quantity planaria	1	2	4	8	16	32			
Total fragments	3	6	11	16	24	15			
Fragments/planaria	3	3	2.75	2	1.5	.469			
Fragments/planaria/day	.088	.088	.081	.059	.044	.014			

build-up. Best, *et. al.*¹⁷ eliminated slime as the prime factor. Perhaps it is a result of the increased concentration of some large molecular weight substance produced by the planaria.

Experiment 5 was designed to test this possibility and the results are suggestive if not conclusive. In previous experiments the rate of fragmentation changes were more than one order of magnitude. In experiment 5 the water diffused away from the high concentration of planaria and the rate dropped only from .097 (1 planaria/bag) down to .040 (16 planaria/bag) fragments/planaria/day. This would tend to indicate that whatever reduces fissioning can diffuse freely in the water. That slime is not the factor is shown. Slime build-up was apparent in the bags with the high density of worms. Yet, the rate of re-

production was not inhibited as drastically as it was in previous experiments.

If the density of planaria is reduced (by the addition of water), eventually one would expect to find a point beyond which additional living space does not increase reproduction. Experiment 6 was an attempt to find this point. It appears that crowding up to a density of about 2 planaria per 100 ml of water does not inhibit fissioning. Beyond this density, reproduction is reduced. The reduction, however, is not simply a function of planaria per volume of water. The rate of fissioning at identical densities was found to be different relative to water volume (compare experiment 6 with 1, 2, and 3). Perhaps it is partly controlled by the surface to volume ratio of the container or by the surface area of the substrate which provides "crawling space."

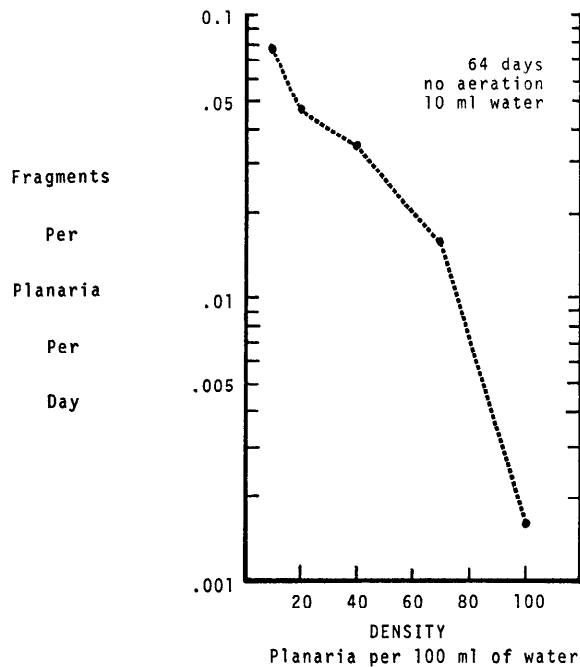


Figure 2. Results of Experiment 1. Planaria from Red Rock Canyon State Park, Hinton, Oklahoma. Twenty-four planaria were distributed 1, 2, 4, 7, and 10 to each jar.

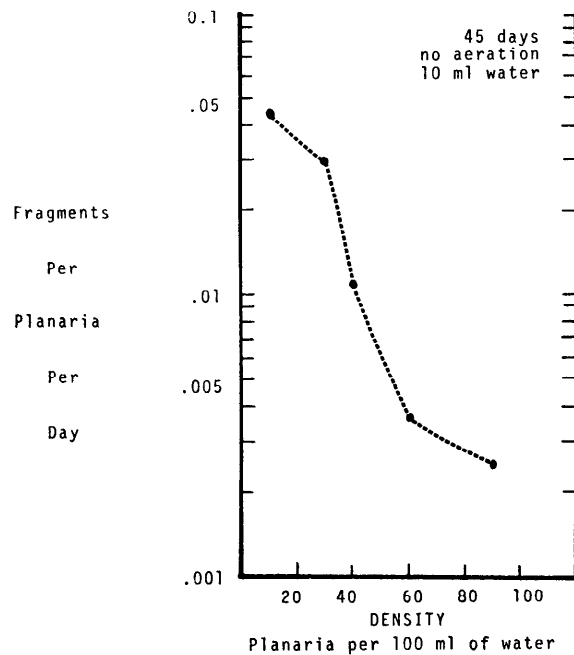


Figure 3. Results of Experiment 2. Planaria from Wichita Mountain Refuge, Oklahoma. Twenty-five planaria were distributed 1, 2, 3, 4, 6, and 9 per jar.

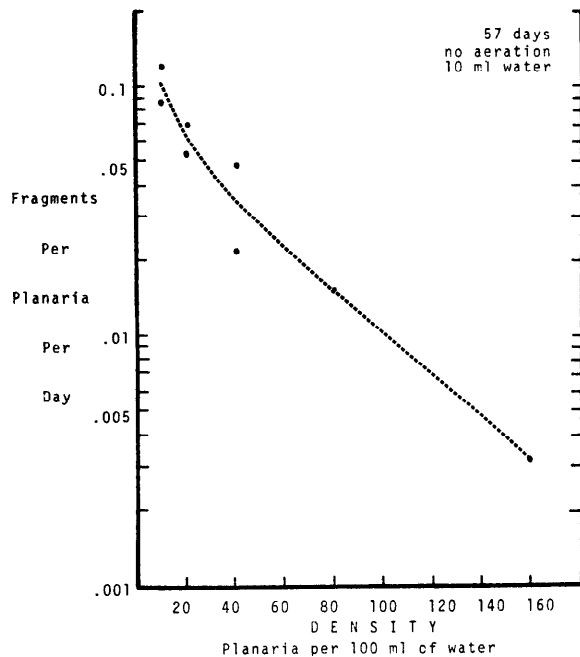


Figure 4. Results of Experiment 3. Planaria from Red Rock Canyon State Park, Hinton, Oklahoma. Thirty-eight planaria were distributed among eight vials as follows: 1, 1, 2, 2, 4, 4, 8, and 16.

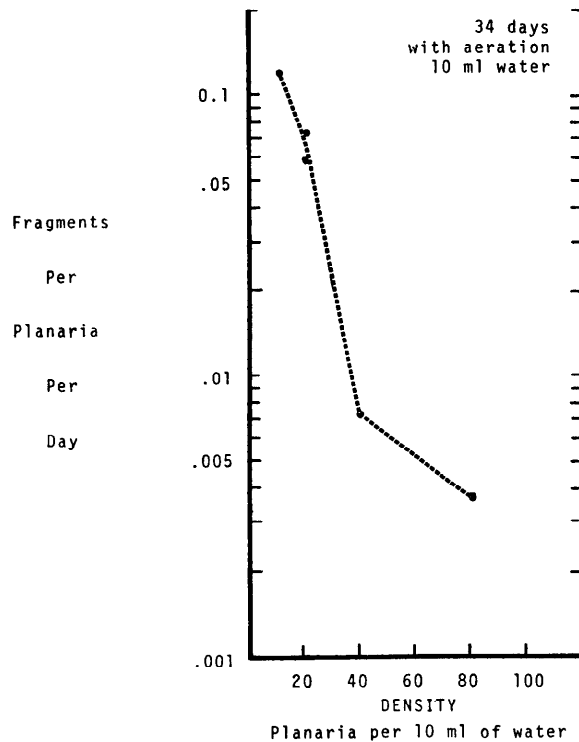


Figure 5. Results of Experiment 4. Planaria from Red Rock Canyon State Park, Hinton, Oklahoma. Thirty-eight planaria were distributed among eight vials as follows: 1, 1, 2, 2, 4, 4, 8, and 16.

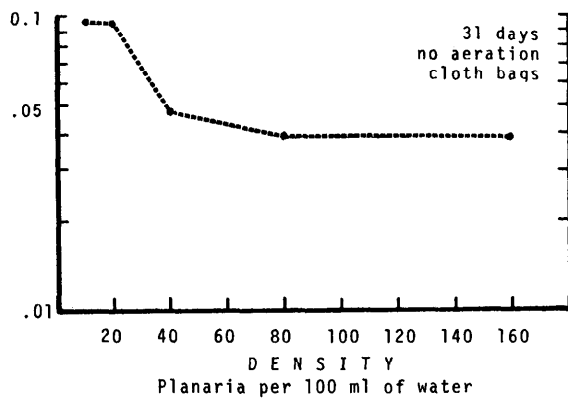


Figure 6. Results of Experiment 5. Planaria from Red Rock Canyon State Park, Hinton, Oklahoma. Planaria were confined in cloth bags suspended in a 1 liter pan of water. Thirty-one planaria were distributed among five cloth bags as follows: 1, 2, 4, 8, and 16.

Licht¹⁸ found that some substance (probably thyroxine) produced by metamorphosing tadpoles induced premature metamorphosis in younger tadpoles that were kept in the same water. An analogous situation seems to occur in planaria with regard to fissioning. Table 1 illustrates that when two planaria share 10 ml of water their fissioning is usually synchronized. Notice that for jar 3 each time one planaria divided so did the other. A similar thing occurred in jar 4 with exceptions on days 48-50 and 51-54. Could it be that the neurohormal substance postulated by Best, *et. al.*¹⁹ as suppressing fissioning is diffusible throughout the water and brings about synchrony in reproduction? This effect was negated under higher crowding and apparently diluted in the 100 ml of water used in experiment 6.

Conclusion

This study indicates a decrease in asexual reproduction of the planaria, *Dugesia dorotocephala*, under conditions of crowding. The inhibition of reproduction is not due to depletion of oxygen or the build-up of carbon dioxide (or other volatile metabolites). It would appear that the reduction in fissioning is the result of some water soluble substance produced by the planaria and not the result of slime formation. At densities below 2 planaria per 100 ml of water, reproduction is not affected by crowding. With a density of 2 planaria per 10 ml of water, the reproduction of both individuals is sometimes locked together, perhaps by some water soluble neurohormal substance.

The planaria should provide a good model for further work. These experiments should be repeated with clonal colonies²⁰ to minimize genetic variability. Further laboratory work needs to be done to isolate the "crowding inhibition factor,"

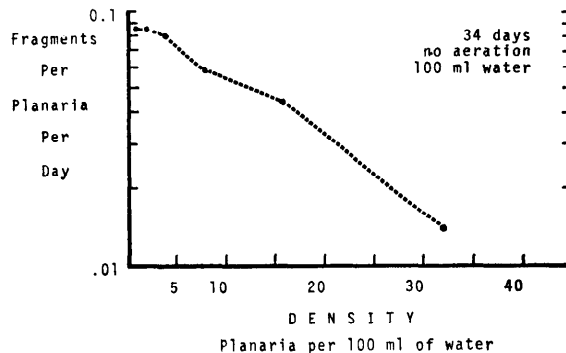


Figure 7. Results of Experiment 6. Planaria from Red Rock Canyon State Park, Hinton, Oklahoma. Sixty-three animals were distributed among six jars as follows: 1, 2, 4, 8, 16, and 32.

and more clearly elucidate the entire fissioning control mechanism.

Finally, and most important in terms of its bearing on Creation or Evolution, field studies must be undertaken to determine if the same or different factors of crowding in nature do indeed tend to regulate the natural population density.

Once again the facts of nature seem to point not to evolution (with its necessity of wide open reproduction) but to a divine creation. Built-in density-dependent reproduction rates were mandatory in the beginning and are quite possibly at work today. Perhaps planaria in an artificial, protected universe is a demonstration of pre-fall ecology. Certainly the study of post-fall population ecology deserves a fresh approach. "It is better to trust in the Lord than to put confidence—in man."²¹

Acknowledgments

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GENETIC ENGINEERING: A BIOLOGICAL TIME BOMB?

DUANE T. GISH*

Claims are being made that man will be able to eliminate genetic defects and eventually "control his own evolution" by a combination of eugenics and specific alterations in his genetic material.

While eugenics, or controlled human breeding, is possible, its beneficial effects would be limited or doubtful, and its practice would be socially unacceptable by the majority of the population.

In vitro fertilization with subsequent in utero implantation of the resultant blastocyst may some day be possible, but success may be limited, and the method most likely would be fraught with many dangers for the developing embryo.

Insertion of healthy genetic material into cells that are genetically defective would have limited benefit even if successful, and the results would more likely be disastrous rather than beneficial. While correction of faulty genes by "genetic surgery" may be theoretically possible, insurmountable technical difficulties will almost certainly forever prevent its use.

The idea that man may someday be able to alter specific human characteristics and thus "control his own evolution" is seen as science fiction rather than as serious science.

Introduction

In an editorial entitled, "Will Society Be Prepared?" in *Science*, 11 August, 1967, Marshall Nirenberg, Nobel Prize-winning scientist, stated that, "Cells will be programmed with synthetic messages within 25 years."

George W. Beadle, another Nobel Prize winner, in his book, *Genetics and Modern Biology*, said that "our knowledge is such that we could, if we chose to do so, direct our own evolutionary future."¹

Immediately after a press conference called by Harvard biologists to announce that they had isolated a gene, the *Evening Standard* in London carried the headlines, "Genetic 'Bomb' Fears Grow." On that same day, another London paper, the *Daily Mail*, headlined a story, "The Frightening Facts of Life. Scientists find secret of human heredity and it scares them."

Gordon R. Taylor, a science journalist, has authored a book published in 1968 entitled *The Biological Time Bomb*.² Mr. Taylor attempts to answer the question, where are the biologists

taking us? He apparently based much of his material on reports similar to the highly speculative predictions and scare stories quoted earlier. Taylor characterizes new discoveries of biologists "as earth-shaking as the atom bomb."

He indicates that the results of these discoveries are not going to explode in some distant future, but during the lifetime of many who are living today (some of whom, he claims, may live to be 150 years old!). He anticipates the early possibility of a child being born 100 years after his father's death; human beings conceived and nurtured into life by processes in which sex plays no part; elimination of diseases caused by genetic defects; and even control of human intelligence through genetic engineering.

There is real cause for alarm, of course, if indeed it will be possible at some time in the future to control human intelligence, emotions, and personality via genetic engineering. The biological, psychological, political, ethical, and moral problems generated would be immense in scope, and perhaps insoluble. The possibility that such developments would be used to advance the public good rather than as a means to acquire power and control over one's fellow men

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would be no greater than that demonstrated by man through his use of explosives, atomic fission, and other technological developments utilized in modern weaponry.

The purpose of this paper is to expose the speculative nature of popular predictions related to genetic engineering and other attempts at biological control.

Proposed Methods of Genetic Control

Control of human reproduction and of human genetics is being advocated or anticipated on the basis of several approaches. A method recommended by some scientists, and which would require the development of no new technology, is controlled breeding involving sperm banks and artificial insemination. A second process is that of cloning, or cell fusion.

As we shall see shortly, cloning has already been performed with animal cells, and some think that application of this technique at the human level is only a matter of time. *In vitro** fertilization, or the production of so-called test tube babies, has been carried out to a very elementary stage, and has been envisioned as the solution to some types of sterility.

A much more remote possibility, involving the development of knowledge and technology not now available and perhaps forever inaccessible, is the technique of genetic engineering, or the modification and synthesis of genes in order to eliminate genetic defects and eventually to remodel man along predetermined lines.

Eugenics: Controlled Human Breeding

Eugenics is defined† as the science and art of improving human breeds by so applying the ascertained principles of genetics and inheritance, as to secure a desirable combination of physical characteristics and mental traits in the offspring of suitably mated parents. Human reproduction at the present time, however, except in relatively few cases, results from a process of random mating. That is, a marriage partner is generally selected without a prior investigation of that partner's genetic background. People just fall in love, get married, and have children.

The late Herman J. Muller, who was a geneticist at Indiana University, is numbered among those who have proposed that such practice be changed. Dr. Muller maintained, for example, that the means exist right now for achieving a much speedier and significant genetic improvement of the human population by the use of selection than could be effected by the most sophisticated methods of genetic engineering that

might be available for the next hundred years or so.

Muller strongly advocated that sperm banks be established containing semen from individuals with documented characteristics. Prospective mothers, with the consent and counsel of their husbands and foster fathers-to-be, would then select semen for artificial insemination from the donor possessing the characteristics desired for the future child. This method of conception, it is maintained, would improve the human race by minimizing the incidence of genetic defects and by improving genetic fitness, resulting in superior physical, mental, and emotional qualities.

Such a process would, if followed by most of the population, minimize, though it would not eliminate, genetic defects. The possibility of a positive effect, or enhancement of desirable qualities, is far less certain.

In animal and plant breeding, we are interested in a relatively few and easily detectable and measurable qualities, such as disease resistance, reproductive capacity, quantity and quality of meat, egg, or milk production. The qualities we would like to see in our children are much more elusive genetically. A splendid physical specimen may not be overly bright. A very bright child may be a bore or a little monster.

The story has been told that a beautiful entertainer proposed to George Bernard Shaw that they have a child, suggesting that the combination of her beauty and his intelligence would produce an unusually gifted child. Shaw declined, with the comment, "Supposing it had *my* looks and *your* brains!"

In addition to uncertainties concerning the attainment of really significant improvement in desirable qualities through selective breeding, the loss of genetic fitness by such a process is a very real possibility. Selective breeding in animals results in a reduction in the total number of genes in the breeding population, with a loss of genetic variability. For reasons not completely understood, this results in a lowered ability to survive under various conditions. Domesticated animals that have been subjected to selective breeding do well because man cares for all of their needs. If these animals were released into the wild, however, most would not survive.

The same results might be obtained in the case of man. The practice of eugenics might lead to a race of people with an increased frequency of certain desirable qualities who, at the same time, had reduced resistance to certain diseases, and who might be unable to cope with mental and emotional stresses.

All of the above is merely academic, I believe; for except for those few who might want to take advantage of this method because of sterility of the husband, only a small minority would ever

**In vitro* means external to a living organism, while *in vivo* refers to a process taking place in an intact organism.

†Funk and Wagnall's New Practical Standard Dictionary, Funk and Wagnall's Co., New York, 1946.

agree to surrender their sharing in their own children's procreation. My children may not be the most beautiful and intelligent in the world, but they are *my* children, and I would have it no other way. Muller and others who advocate the practice of eugenics are simply out of touch with the real world. Furthermore, consistent practice of "artificial insemination" in cattle has led to the production of malformed "bulldog" calves which are routinely destroyed (culled) in the breeding program. Such a result and program among human beings would be unthinkable.

Cloning, or Cell Fusion

Successful experience with cloning, or cell fusion, using cells from frogs has encouraged some to believe that this technique may someday be applied to humans. Dr. J. B. Gurdon, a biologist at Oxford University, has performed some highly interesting experiments in this field³

Gurdon, using a very tiny pipette, removed the nucleus from a frog egg. The nucleus contains much of the genetic material of the cell, of course, and thus an egg could never develop without a nucleus. Gurdon removed the nucleus from one of the cells of a frog embryo and inserted it into the egg which had been deprived of its nucleus. The egg then was allowed to develop. In some cases the egg developed to the tadpole stage only, but in other cases fertile adult male and female frogs were produced. Many experiments were unsuccessful, of course.

Usually nuclei from unspecialized embryonic cells were used. In a number of cases, successful experiments were carried out using nuclei derived from completely differentiated cells of the intestinal epithelium of tadpoles. These cells were intestinal cells, yet when nuclei from these cells were placed in egg cells which had had their nuclei removed, these eggs in some cases developed just like normal eggs, producing fertile male and female frogs.

This experiment demonstrated what scientists had already suspected. All cells from an animal, whether skin, intestinal, muscle, nerve, or liver cells, or any other kind of a cell with a nucleus, contain all the kinds of genes that were originally present in the fertilized egg that gave rise to the adult animal. During the development of the animal from the egg, by some mysterious process, cells become programmed in such a way that some develop into skin cells, some into bone cells, others into muscle cells, etc.

Apparently in each case only a fraction of the genes present in the nucleus of each cell are activated, the remainder being suppressed. The particular set of genes that are activated in each type of cell determines what kind of a cell it becomes. Scientists have no idea whatsoever how all of this takes place. They may never know.

It is one of the greatest marvels of God's creation.

The genes in the nucleus of the intestinal cell taken from the tadpole had already been programmed, of course, to produce an intestinal cell. When this nucleus was placed in the enucleated egg cell, this programming was reversed. All of the genes were able to function, and a complete frog was produced from the egg.

Some scientists are saying that extension of this process to man is only a matter of time. They are saying that someday we will be able to take cells from a human donor, remove the nuclei, place these nuclei in human eggs from which the nuclei had been removed, implant each such egg in the uterus of a mother-to-be, and allow each egg to develop into a baby that would grow up to be a perfect copy of the donor. Poof! Instant Einsteins if you wish! Or perhaps a dozen Van Cliburns! A militaristic dictatorship might require its womanhood to produce copies of its finest soldiers and generals.

Although we cannot positively say that this process will never be possible at the human level, we wish to point out that the frog is an amphibian, and such a technique may never succeed with mammalian cells and, in particular, with human cells. There is a vast difference, after all, between a frog egg and a human egg. The two eggs are designed to develop under entirely different conditions. Such manipulation might cause the human egg cell, if it developed at all, to give rise to a monster rather than to a normal human being, because of defects during embryological development.

Furthermore, the cells used in the frog experiments were derived either from embryos or from tadpoles. Although the cells taken from the tadpoles were fully differentiated, that is, they were taken from a definite type of tissue or organ, we do not know whether nuclei derived from cells of an adult frog would have resulted in a successful experiment. Perhaps irreversible changes in cells take place during the metamorphosis of a tadpole into an adult frog.

I don't think we need to lie awake at night worrying about cloning of human cells. People won't be produced any faster this way than by the normal reproductive process, and the results, if a normal healthy individual is produced, would be perfectly predictable. The child would be an exact genetic copy of the person donating the nucleus—no better, no worse.

In Vitro Fertilization—Test Tube Babies

Some medical scientists have been investigating fertilization of human eggs *in vitro*, that is, outside of the body. This is often referred to as attempts to produce test tube babies, but it must be remembered that in the process now being in-

vestigated, only fertilization would take place outside of a human body. The production of the sperm and ova and the subsequent development of the embryo all would take place inside human bodies.

Biologists have been fertilizing eggs of various species *in vitro* for many years, although, as yet, successful implantation of such fertile eggs in an animal and development of the embryo to birth has, as far as I know, never been accomplished. Failure to go beyond such limited success in animal research does not bode well for success in human beings.

Many difficult problems associated with such a process have so far caused success with human cells to be very limited. All the eggs a woman will ever produce come from tissue present in her ovaries at birth. A generative cell must undergo several divisions before a mature egg, or ovum, is produced (the other cells produced are discarded). Secretion of certain hormones are required before the ovary can be induced to release an ovum. Certain substances, found in the female reproductive tract, must be present to enable the sperm to penetrate the ovum in order for fertilization to be consummated. Carefully controlled conditions are required for subsequent development of the fertilized egg.

Dr. Robert G. Edwards and Dr. Patrick S. Steptoe, both of Cambridge University, are among the leaders in work with human cells. Dr. Edwards has fertilized human eggs *in vitro* and has succeeded in developing them to the blastocyst stage.⁴ This is the stage normally reached about six to eight days after fertilization, and it is at this stage that implantation in the uterus usually takes place during normal reproduction. Attempts may soon be made to implant such a blastocyst in a human uterus. This would first be tried in a woman who had been infertile or barren because of blocked oviducts. The egg would have been obtained from her ovary and the sperm from her husband, of course.

Such a process, if ever successful, would doubtfully become routine. Many failures could be expected along with the successes, and the medical and laboratory procedures required would be very costly. The procedure would allow women to bear children who had been barren because of failure of their ova to reach the normal site of fertilization. It would even enable a couple to hire another woman to bear their child, a so-called "surrogate mother."

This might be done in a case in which a woman, although capable of producing fertile ova, is for some reason physiologically unable to bear children. This method might even be utilized by women who are capable of bearing children and desire children, but who do not wish to bear children themselves.

Whether babies will ever be produced by *in vitro* fertilization cannot be predicted. Timing would be very important for successful implantation of the blastocyst in the uterus. In the normal monthly cycle, a single egg usually erupts from one of the ovaries. The space in the ovary from which the egg erupts develops into what is called the corpus luteum.

The corpus luteum secretes hormones that are required for the implantation of the developing egg in the wall of the uterus. Absence of this secretion, or poor timing, would result in an unsuccessful pregnancy. The *in vitro* manipulation of the egg and resultant blastocyst might result in either spontaneous abortion or the birth of a defective child.

Work along these lines should be no cause for alarm. If successful, some effect on birth rate would result. This procedure would offer no opportunity, however, to significantly alter or control human reproduction.

Some scientists have even visualized the day when babies will be developed entirely outside of a human body—true test tube babies. In a few cases it has been possible to keep an animal embryo alive for a few days after removal from the uterus. While it might be worthwhile to develop methods for keeping premature babies alive by some sort of artificial means until full term is reached and development is complete, it seems silly to even think about trying to produce real test tube babies.

After all, God has already provided the safest, surest, most satisfying way of producing babies—mothers. Even if it should ever become possible for a human being to be produced outside of a human body, which is unlikely, complex medical and technological procedures would be required. This would demand the use of expensive equipment, facilities, and personnel for the nine months required to develop the fetus. The cost would be prohibitive. Of what practical use is a synthetic method that produces a product at a cost many times that of the natural product?

Genetic Engineering—Repair of Defective Genes

In a section on "genetic surgery," in his book *The Biological Time Bomb*, Taylor quotes a Professor Tatum as reporting that there would be only "minor technical difficulties" involved in inserting genetic material into germinal cells. Taylor's way of telling things helps to sell his books, but does little to inform readers concerning the nature of the real world. Inserting genetic material into germ cells with retention of viability more probably will be enormously difficult. To do so in such a way as to obtain predictable and favorable results may well prove to be impossible.

In a news account of experiments by British

scientists in which genetic material derived from chick embryo cells was inserted into somatic cells of a mouse (all cells in an animal except germ cells are called somatic cells), *Nature* emphasized that "... although these experiments offer the exciting prospect (in theory at any rate) of evolving a therapy for mutant somatic cells, there are formidable, and very possibly insurmountable, objections to developing from them a technique which would apply to germ cells."⁵

There is quite a difference between "minor technical difficulties" and "formidable, and very possibly insurmountable objections"! Furthermore, getting the stuff into a germinal cell is only one small part of the problem. Let us take a closer look at this matter of correcting genetic defects using "genetic therapy" and "genetic surgery."

There are at least 1500 known genetic defects which cause crippling conditions or death in human beings;⁶ such as,

- hemophilia, a blood-clotting deficiency;
- sickle-cell anemia and thalassemia, blood disorders;
- phenylketonuria, a single enzyme deficiency which results in complete arrest of mental development in a newborn within a few weeks if not detected and treated;
- Tay-Sachs disease, another condition caused by lack of a single enzyme and which causes general and rapid deterioration of the nervous system in babies and death within a few years; and,
- juvenile diabetes, caused by failure of the Beta cells of the pancreas to produce a sufficient quantity of insulin.

There are about 140 amino acids in each of the four proteins (two each of the "alpha" and "beta" proteins) that combine to form hemoglobin, the oxygen-carrying protein of blood. In sickle-cell anemia, the amino acid at position #6 (glutamic acid) in the beta chain of hemoglobin is replaced by another amino acid (valine). This seems like a very minor change, but when the faulty gene causing this condition is inherited from both father and mother, the condition is fatal, usually within a few years of birth.

Genetic engineering in this case would consist of attempts to replace the faulty gene with the normal gene. Ultimate treatment would consist of an excision of the faulty section of the gene and insertion of the correct structure. The former might be called genetic therapy and the latter, genetic surgery. Limited genetic therapy may someday be possible, but insurmountable technical difficulties seem to render genetic surgery outside of human capability.

Special Methods of Cell Culture

The very interesting experiment performed by British scientists referred to earlier is described in detail in *Nature New Biology*.⁷ The Oxford scientists, A. G. Schwartz, P. R. Cook, and Henry Harris, inserted small amounts of healthy genetic material from chick embryos into mouse cells that were deficient in one of its enzymes because of a genetic defect. The chick cells had the normal genetic material which codes for this enzyme.

The incorporation of this genetic material into the mouse cells permitted them to produce the enzyme. Most of the hybrid cells died but a few survived. They grew in cell culture and were now able to produce the enzyme in which they were previously deficient.

In this and similar experiments the cells were grown only in cell culture. None were implanted in an animal. It is hoped that eventually, for example, cells from the pancreas of a diabetic could be removed, treated with genetic material from a normal individual, grown in cell culture and then re-implanted in the pancreas of the patient. Such cells, it is hoped, would give rise to pancreatic tissue producing a normal supply of insulin.

Such a procedure in man most likely would actually be disastrous. First of all, the chick embryo genetic material in the British experiment was complexed with an inactivated mouse virus to carry it into the mouse cells. This technique of complexing with a virus to transport genetic material has been used by other investigators.

The presence of this viral material (DNA or RNA), even though inactivated, could potentially be very harmful. No one can really predict what effect such material might have on cells placed in human beings. Such cells might even turn out to be cancerous.

Since these hybrid cells would contain an enzyme and other material from foreign cells, the placing of such cells in an intact animal or human body almost certainly would stimulate the body's immunological defenses. Even in those cases where all human material was used, the hybrid cell might be antigenic to the recipient.

White blood cells and antibodies would be produced which would attack and destroy the hybrid cells. Not only would this result in failure of the attempted genetic therapy, but severe allergic reactions might occur.

Other less predictable but harmful effects might result. The final effects of such "therapy" more than likely would be far more severe than the original defect. Would you permit your child, even though suffering from a defect, to be used as a guinea pig in some such experiment?

Experiments on genetic therapy have been carried out so far only on somatic cells. Even though eventual success is highly unlikely, such therapy,

even if successful, would be of immediate benefit to the patient only. His germ cells would still carry the genetic defect and would be passed on to his children. Such treatment would actually increase the incidence of genetic diseases by permitting such genetic defectives to live and to reproduce.

It is highly doubtful whether sperm or egg cells in which genetic material had been inserted could live to produce a normal adult. The limitations and dangers in such a procedure have already been discussed in the section on cell cloning or fusion.

Genetic Engineering—Genetic Surgery

The chances of success with "genetic surgery" is even more remote than that with "genetic therapy." Genetic surgery would consist of an attempt to correct a faulty gene rather than to replace or supplement it with a healthy gene. Success must be obtained with a whole series of procedures before genetic surgery would be possible. The probability of success with each of these would be exceedingly low. Improbability piled on improbability equals impossibility.

In the nucleus of every human cell there are possibly several hundred thousand genes. At present we do not have the slightest idea which gene is which. How are we to "lay our hands" on the particular gene needing correction? Even if we knew which gene is which, how would we separate it from the hundreds of thousands of other genes in order to isolate it for treatment?

After having solved these two formidable problems we still would not have the slightest idea in most cases what to do in order to correct the defect. The particular genetic defect is known in sickle-cell anemia and in a few other cases, and geneticists thus know what needs to be done. But what is wrong with the genes of a hemophiliac? What defect causes diabetes? Answers to these and similar questions must be obtained before attempts can be made to correct these and most other genetic defects.

Now supposing we have located and isolated the faulty gene, have pinpointed the defect and know what needs to be done to correct the defect. We have no way at the present time to selectively make the change required and it is almost certain that no such method will ever be developed.

Most genes consist of several thousand sub-units, or building blocks. These sub-units are linked together like the links in a chain. There are only four different kinds of sub-units (called nucleotides). In other words, the genetic code is constructed from a four-letter alphabet. In a gene consisting of 4,000 nucleotides, there would be roughly 1,000 of each nucleotide (proportions vary in each gene).

In almost all genetic defects only a single one of the several thousand sub-units or nucleotides is faulty and would require replacement with the correct sub-unit.

If we designate the sub-units in the gene by the letters A, T, G, C, we would have roughly 1,000 A's, 1,000 T's, 1,000 G's, and 1,000 C's distributed in a particular sequence in our hypothetical gene. Now let us suppose that the genetic defect could be corrected by replacing one of the A's at a specific point with a G. Let us say that this A is at position 3163 along this chain consisting of 4,000 sub-units.

There is no procedure available, or even conceivable at present, for effecting one particular sub-unit out of thousands without indiscriminately affecting others. In the above example, we would have no way of replacing the A at position 3163 without randomly replacing other A's scattered along the chain.

Since chemical reagents, radiation, and other agents used to alter chemical structure act randomly, no conceivable method would allow their use to make selective changes in genetic structures. Other more selective methods for altering chemical structures in genes may someday be developed but none are on the horizon today.

Furthermore, selectivity in genetic engineering must be absolute. No mistakes must be made. If the method used is slightly slipshod, a genetic nightmare might result rather than a genetic miracle. People who speak airily about genetic engineering just have no idea what the real problems are.

In summary, it may be said that while genetic therapy and genetic surgery may some day be theoretically possible, putting theory into practice may be prevented by a series of practical impossibilities. It is a dream that will most likely never be realized.

Genetic Engineering—Synthesis of Genes

Some scientists are saying that the ultimate solution for the problem of genetic defects is the synthesis of an entire gene. Rather than attempting to correct a genetic defect in a gene, normal genetic material would be synthesized in the laboratory and inserted into cells derived from an organ of the patient. Then, as described in the previous section, these treated cells would be grown in cell culture and later reimplanted in the defective organ. Many of the same limitations encountered with gene therapy discussed earlier would be faced in this method of treatment.

Furthermore, the difficulty in synthesizing a gene containing hundreds to several thousand sub-units, each of which must be put in its proper place with absolute precision, would be inconceivably great. A team of scientists have synthe-

sized a genetic fragment containing less than 80 sub-units. The synthesis was long and difficult, requiring many months of work by a team of researchers, and only a tiny amount of product was obtained. No doubt the material was not pure, but contained many molecules of faulty structures. Comparing the synthesis of a genetic fragment with 80 sub-units to the synthesis of a gene with several thousand sub-units is like comparing the construction of a one-story frame house to the construction of the Empire State Building. The tools that suffice for one would hardly suffice for the other.

The scheme that really excites the imagination, and which spreads alarm among laymen, is the idea that someday it will be possible to synthesize a whole complex of genes, insert them into germ cells and thereby produce offspring with altered physical and mental characteristics. We would then be able, it is said, to "control our own evolution." Such a possibility is so remote that there is really no cause for excitement or alarm.

The genetic factors controlling complex organs, intelligence, and personality are what we know the least about. In fact, it can be said that we know nothing about them, except that they are complex. Most characteristics in the human, in fact, are not controlled by a single gene, but are under the control of many genes. These characteristics are said to be polygenic. Furthermore, most genes effect, or help to control, more than one characteristic. It can be seen that the genetic apparatus of the human, or of any other animal, is inconceivably complex.

In addition to not knowing which gene is which, we don't have the slightest idea how to alter a gene in order to obtain a specific result. Altering a single gene would almost certainly upset the balance in the gene complex with which it is associated, producing monsters and mental defectives.

One Gene—One Characteristic: Impossible

Since most genes affect many characteristics, it would be impossible to synthesize a gene tailored to alter one characteristic without effecting others. A change in a gene which was tailored to improve eyesight, for instance, might result in an impairment in, or loss of, the sense of smell, if that gene participated in control of both of these organs. Deleterious effects on every characteristic governed by this gene could result, of course.

To change a characteristic that is under polygenic control, and most are, as we have mentioned, it might be necessary to alter every one of the genes in the gene complex controlling it in order to produce the effect desired. Imagine the problem, if one's imagination can stand the

strain, of fathoming the specific changes that must be made in these genes in order to produce the desired effect, synthesizing each one of the genes, inserting the synthetic genes into a germ cell, and finally developing the germ cell into a human being! Science fiction, yes. Worthy of serious consideration? No!

At this point it would be well to hear from Dr. George Gaylord Simpson on this subject. Being the dean of the world's evolutionary paleontologists and an atheist, it could hardly be said that he shares our view of man, his origin and his future. If some should claim that our views are prejudiced by our Christian convictions, it can certainly be said that Simpson's views are not similarly affected. In an article published just a few years ago. Dr. Simpson stated,

Most radical is a third suggestion about genetic engineering, that it may become possible to make genes to order and to insert them in human germ cells so that they would henceforth be inherited. This has had some sensational publicity and has also been viewed with alarm by those who like to view things with alarm. The excitement is premature, to say the least. Just a few of the impediments are: that we do not now know the actual structure of any human gene; that we do not know how to insert or replace genes in germ cells; that we do not know precisely how any gene produces such important traits as intelligence or temperament, or for that matter even such simple characteristics as stature; that the genetic system is an interacting whole so that insertion of a synthetic gene if it worked at all would have unforeseen and probably disastrous results. It is that last point that suggests that genetic synthesis, if possible, would be more likely to work for the public ill than for the public good."⁸

Professor Simpson agrees with us, therefore, that scientists have yet to find the secret of human heredity, and that there is indeed little to fear that a genetic bomb is about to explode in human society.

Man, in his ego, wants to play God. He dreams of unlimited potentialities through his own devices, but he is doomed to disappointment.

Know ye that the Lord He is God; it is He that hath made us and not we ourselves. . . . (Psalm 100:3)

I will praise thee; for I am fearfully and wonderfully made. . . . (Psalm 139:4)

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HOW MUCH LIKE ENGINEERING IS "GENETIC ENGINEERING"?

HAROLD ARMSTRONG*

Introduction

Every now and then one reads or hears something about "genetic engineering." Rather extravagant promises are made; such as, prevention or cure of certain diseases or changes in men and animals in ways which are supposed to be beneficial.

Such manipulation is often viewed with alarm. Rarely is it pointed out that what can be done in this way is at the present limited, and that there is no guarantee that much more will be possible in the near future.

However, in 1971, two authors have pointed out that some restraint is in order in talking about medical uses of such techniques. There are only a few genetic troubles which it seems feasible to consider curing by genetic manipulation; and, there is always the possibility that such manipulation might have undesirable side-effects. S. M. Fox and J. W. Littlefield concluded:

The promises offered by the proponents of gene therapy largely ignore its limitations and hazards. To mislead the public in this regard risks another period of disappointment and reaction. . . . Let us not do to ourselves what we have done to our environment. Let us now seek public support for research toward a better understanding of normal and abnormal human biology, rather than promise quick glamorous cures.¹

Authors of a more recent article likewise urge caution.² They point out that benefits to be expected from gene therapy are limited, and that it is not at all certain what side-effects there might be.

When I started to write about this matter, my first inclination was to dismiss most of what is written about "genetic engineering" as wildly extravagant, and to insist that, whatever it may be, it is not engineering. However, a friend pointed out that I could not ignore that, call it engineering or what you will, plant-breeders (and also animal-breeders) certainly have substantial

accomplishments to their credit. At the same time it occurred to me that often there are two stages to engineering, and that the plant-breeder's work, for instance, might quite fairly be compared with one of the stages.

Two Stages of Engineering

Two stages of engineering show up especially well in electronics. Some engineers design and make the components: transistors, and so on, for instance. Other engineers take these components and assemble them into what we might call systems; a radio receiver, in this sense, would be a system. It is true that recently the introduction of integrated circuits has, in some cases, blurred the distinction between the two stages; but the illustration will still serve our purpose.

In view of this distinction, will it not be agreed that the genetic engineering which is actually done, in plant-breeding for instance, corresponds to the second stage of engineering? There are physical features of plants, desirable or otherwise, which it is known can be inherited; these are the components. The breeder, by crosses, assembles the desired features into the "system," the hybrid plant which is produced.

Among roses, for instance, which have been bred very extensively, the components might be such things as glossiness of the foliage, a certain color, a certain shape of bud, and resistance to diseases. Desirable and undesirable features are likely, at first, to be found together; the breeder tries to eliminate the undesirable ones and keep the desirable.^{3, 4}

Breeders Utilize "Components"

In all this, the breeder is just using the features—the "components"—which he can find in the various varieties of living plants. It may well be that some of those features arose from mutations. So it may be worth his while to bring about a great many mutations in a short time, and to see whether any of them are useful to him. Of course, this has been done.⁵

But still, this is hardly what we have called the first stage of engineering. It is more as if, during the assembling, one were for instance to heat

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a component (as I have seen done), to change its characteristics somewhat.

But the plant-breeder does not propose to go beyond the features which occur, somewhere or other, in the plants with which he is working. He does not propose to produce roses with green petals, or with foliage like that of asparagus.

If it should become possible to "dig" into cells and to manipulate the chromosomes, or to alter things in some similar way, that would still not affect the truth of what has been said. It would still be a matter of assembling **existing** features; only the new method might be more efficient than the old. It still gives no way of introducing an entirely new feature—of producing a race of men with wings, for instance.

We have seen, then, that there is a solid record of success for plant-breeding and animal-breeding, but that there is no evidence to show that some of the exaggerated proposals made in the name of genetic engineering are or ever will be possible. What else is to be concluded?

As these matters apply to human beings, the question is one of eugenics. There have been many proposals, going back at least as far as Plato's *Republic*,⁶ for breeding a super-race. History shows clearly enough what becomes of such attempts.

In Plato's time, it was commonly believed that the best example of applied eugenics was to be found in Sparta. But Aristotle, writing about fifty years later, gave the verdict of history, when

he said that we must judge the Spartans, not by what they used to be, but by what they are now.⁷

Application to Evolution

These considerations can be useful also in discussing the question of evolution. The breeder can bring about limited changes, even within a few generations. Sometimes, special methods, such as back crossing, are needed to establish these changes. Certainly no breeder would undertake to breed roses into daisies, or something of that sort.

So since we find here that the kinds are "fixed," although variations within kinds are possible, is it not reasonable to conclude that there never were any changes across kind? And in that case the kinds must have been created separately; which, of course, is just what Scripture teaches.

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- ⁶See *The Republic* by Plato, in and around Book 5, in any edition.
- ⁷*Politics* by Aristotle, Book 8, Chapter 4.

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THE BIBLE, RADIOCARBON DATING AND ANCIENT EGYPT

RONALD D. LONG*

In the mid-1960's Egyptologists and radiocarbon chronologists were in an awkward predicament while attempting to reconcile differences between historical and astronomical data by means of C14 determinations. Evidence derived from radiocarbon dating did not match with what experts in the history of the ancient Near East had reasoned was the astronomical basis for Egyptian dynastic history. Specimens sealed to certain years B.C.E. by means of the chronology based on astronomical anchor points, related dates through the radiocarbon method which did not match the accepted dating system. Differences were often in the magnitude of centuries. Archaeological, methodological, and geophysical explanations for the discrepancies were sought. No answers were forthcoming. What was overlooked and should still be employed is an historical and Biblical explanation.

Nevertheless, dendrochronologists and geophysicists did arrive at, what was believed to be, some physical reasons for the discrepancies. Beginning with de Vries, and continuing under Suess, Ferguson, et. al., the claim was made that a recalibration of C14 dates is possible which verifies accepted and "astronomically" founded Pharaonic chronology. On the other hand, it was also asserted that this supported the accuracy of the dating technique. Radiocarbon dates without calibration do not verify and support the ancient history of Egypt as it is taught today.

*In Egypt a general calendrical date could be assigned to an object assuming the historians were correct in their reconstruction of history. With the tree-rings of the bristlecone pine (*Pinus aristata*), however, near absolute calendrical dates corresponding to ancient Egyptian times could be checked by radiocarbon dating. That is, near absolute calendrical dates were utilized with the assumption that the dendrochronologists counted the "annual" rings precisely. Calendrical or true age of the tree rings did not result in the same age as that gained from C14 analysis. Dendrochronologically dated tree rings revealed problems, therefore, which when combined with other investigations demonstrated the fact that some of the foundational assumptions of C14 dating were invalid and needed restating.*

From recent research, the following facts have become known: production of C14 by cosmic rays has varied due to a) modulation of the galactic cosmic ray flux, b) changes in exchange rate between the atmosphere and the oceans, c) changes in the earth's magnetic dipole moment, and d) worldwide fluctuations in atmospheric concentration of radiocarbon. In addition, dendrochronologically dated tree-rings from trees of the southern hemisphere do not generate the same true or calendrical age and radiocarbon age relationships as that related by radiocarbon dated tree-rings of bristlecone pine. It is now an admitted possibility that the amount of radioactive C14 available to living organisms may vary with altitude, and that "dead" tree-rings may absorb C14. We are left with pre-calibration C14 dates for Egypt which, in fact, closely match the correctly correlated Egyptian-Biblical chronology.

Introduction

Egypt is the one location in the ancient western world where the following exist: specimens of sufficient antiquity, free from contamination (in part due to the dry climate), sealed to a particular pharaoh's reign (since the cartouche is often discovered engraved on objects or in a tomb), and where there is a fairly complete literary history. From Menes, the first pharaoh in the late fourth millennium B.C., to Augustus, Caesar at Rome when Christ was born, the land of the Nile has had a continuous line of royal successions. Fortunately, the list of rulers and their reigns were recorded.

This being the case, some Egyptologists have utilized radiocarbon dating in an attempt to verify their chronology. Supposedly, the astronomically founded time-scheme of Egypt is already firmly established. If C14 dating is a legitimate and precise, scientific dating technique,

archaeologists should be able to substantiate Egyptian chronology by obtaining dates from radiocarbon analysis. On the other hand, geophysicists feel that they ought to be able to test and prove the tangible exactitude of the C14 method by dating ancient Egyptian materials already sealed to a certain limited time span. These conclusions are based on the assumption that the absolute astronomical dating of Egypt is accurate.

Astronomical Suppositions

At some point in the distant past the approximate coincidence of the Nile with the heliacal rising of the star Sirius marked day 1, month 1 or Thoth 1 of the Egyptian calendar. Ancient Egypt's year consisted of twelve months of thirty days each with an additional five epagomenal days or a 365 day year. Accordingly, the calendar was $\frac{1}{4}$ day short every year or 1 day in 4 years. Egyptologists assume that throughout Pharaonic time no corrections or changes were made in this system.

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Thus, the error accumulated until only once in 1460 years would Thoth 1 and the heliacal appearance of Sirius (Sothis to the Egyptians) on the horizon occur at the same time. In operation, this Sothic cycle of 1460 years meant that the seasons and months had no significance in relation to each other since they wandered throughout the year. In order to support this hypothesis enormous emphasis has been placed upon seven statements regarding the heliacal risings of Sirius. An analysis of the seven demonstrates, however, that there is no proof for astronomical dating.

Four of the seven citations are crucial to the hypothesis: the Illahun and Ebers Papyri, Elephantine date and Medinet Habu calendar. The other three sources are not of the ancient Middle and New Kingdoms. No Sothic dates derive from the Old Kingdom.

Egyptologists claim that the fragmentary Illahun Papyrus refers to a heliacal rising in a specific year of Pharaoh Sesostri III. Thus, a date is established in Dynasty XII and a means is made available to assign a beginning date for Dynasty I on an "astronomical" base. In truth this is a hoax since no pharaoh is named on the papyrus!¹

The hieratic writing within the cartouche of the Ebers Papyrus is so indistinguishable that scholars have had to rely on guessing for the identification.² Many, including Ebers himself, felt that it was Bicheres of Dynasty IV rather than the current choice of most experts today, Amenhotep I of Dynasty XVIII.

Elephantine's Sothic date originated in an unknown year of Thutmose III and is, therefore, of little value for the establishment of an absolute chronology. Whether the Medinet Habu calendar belongs to Ramesses II of Dynasty XIX or Ramesses III of Dynasty XX is not known. The difference of many decades between the two pharaohs makes this source useless.

"Astronomical" dating for Egypt might have weathered all criticism, if C14 dating had not proven it wrong. Unfortunately, radiocarbon chronologists have trusted the "astronomical" dating and were influenced to tamper with the real C14 ages through calibration.

The Controversy

In 1962, W. C. Hayes represented the consensus among Egyptological experts in *The Cambridge Ancient History* by writing, "For Egypt in the dynastic period the results so far obtained from the carbon 14, the radiocarbon method of dating . . . are not sufficiently precise or sufficiently consistent to contribute much of value to our reconstruction of Egyptian history."³

Willard F. Libby, founder of radiocarbon dating, after considerable examination of the available evidence in 1963 made this statement:

"These plots of the data suggest that the Egyptian historical dates beyond 4,000 years ago may be somewhat too old, perhaps five centuries too old at 5,000 years ago, with decrease in the error to 0 at 4,000 years ago."⁴ Other geophysicists also suggested that the problem resided in history.⁵

Colin Renfrew, European prehistorian, has observed the development of this controversy between physics and Egyptology. In 1971, Renfrew was able to write as a matter of past history that, "the discrepancy was to be set at the door of the physicist rather than the Egyptologist. The consequences were dramatic."⁶

The Data

Before an examination of the reasons for discrepancies in the interpretation of the radiocarbon dating results, we should take note of the published dates which denote the problem. Some of the radiocarbon values as published beginning in 1955 are listed in Table I.

Over 150 C14 dates have been published for ancient Egyptian materials. Due to space limitations, Table I contains approximately one-third the total number. Dynasties I, XII and XVIII have been given special attention as they are pivotal to an understanding of Old, Middle and New Kingdom chronology. Publication of *Radiocarbon Supplement*, connected with the *American Journal of Science*, began in 1959. Within the period between 1955, when Libby issued his work on the method, and 1959, there were a few minor dates for Egypt published in *Science*. Dates from the 1960, 1961, 1970 and 1972 (part 1) copies of *Radiocarbon Supplement* are not included in this paper since they do not contain any additional or pertinent information for this discussion.

Of greatest importance is the fact that this series of determinations in Table I corroborates the Bible and corrected Egyptian history. The list absolutely negates the accepted or evolutionary interpretation of Egyptian history (i.e. succeeding non-parallel dynasties)—hence the pronouncement of Prof. Hayes.

A common attitude to be found among archaeologists regarding these data is, as Säve-Söderbergh reported: "If a C14 date supports our theories, we put it in the main text. If it does not entirely contradict them, we put it in a foot-note. And if it is completely 'out of date', we just drop it."⁷ Dismissal of Table I by archaeologists is based on the view that refinements in C14 dating and tree ring calibration corrects C14 dates so that history and the method are reconciled.

The Search Begins

In 1958, de Vries discovered variations in the concentration of radiocarbon with relation to

TABLE I

Sample No.	Dynasty	C14 Age: (Before Present)	(B.C.)	Accepted Historical Date (B.C.)	Biblical Date (B.C.)
C-1	III	3699±770	1749	2700	1718
		4234±600	2284		
		3991±500	2049		
		average 3979±350	2020		

Acacia beam from the tomb of Zoser at Sakkara. "Known age" according to Wilson is 4650±75 B.P.

Note: B.P. in all dates given refers to before 1950 A.D.

Historical ages are given in accordance with *The Cambridge Ancient History*, latest revisions.

Biblical dates are from a strict and literal interpretation of Scripture correlated with ancient history. See Herman L. Hoeh's *Compendium of World History*.

The dating of this acacia beam is closer to the Biblical date than the historical date in every case. All the dates show, as they should, that the wooden beam is older than the tomb. An acacia being several hundred years old at the time it was cut down for use in the tomb of Zoser gave a determination of several hundred years before the death of the Pharaoh. Note should be taken of the fact that this was the first published date using the method invented by Libby. If 2700 B.C. was the correct date for the death of Zoser then all the C14 dates should have been at least one hundred years older than 2700. All of the dates are far too low for Egyptian history without the Bible to be correct.

Source: W. F. Libby's determination found in *Radiocarbon Dating*, 1955, 2nd edition, University of Chicago Press, Chicago, U.S.A.

U-4	I	3840±150	1890	2810±100	2000
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Charred grains in large vessel in tomb 6 at Ma'sara.

Here is an excellent case where the large discrepancy between C14 dates and accepted history can be seen. Contrast this difference of almost one entire millennium with the close comparison between the C14 age and the Bible.

BM-27	I	4100±150	2150	3008±200	2050
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Wood (acacia, probably *A. arabica*) from a brick mastaba at Sakkara. Tomb belonged to Hemaka, a vizier, dating to the reign of Udimu.

Again the difference between the C14 date and history is striking. Since the wood cut to be used in the tomb was perhaps 80 years old the Biblical date coordinates well with C14.

P-214	I	4447±150	2497	3008±200	2050
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Acacia wood from the tomb of Hemaka.

This reading is perhaps too high, although it could just be very old wood. It will be noticed that with the passage of years the technique of dating improved and greater accuracy was attained which showed the close similarity between the Bible and C14. The wood should have dated older than the estimated historical date for Hemaka. Instead, the C14 result was five centuries after the death of this official.

P216	IV	4082±102	2132	2708	1726
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Cedar log of upper chamber of southern pyramid of Snefru at Dahshur.

Estimated age is 2708 B.C. The cedar log used by Snefru for his pyramid construction was fairly old when it was cut. Again the C14 date is far too young for a log that was supposed to have been old enough to be used in a structure in the 28th century B.C.

P-11	XIII	3710±98	1760	1858	1680
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Cedar from outer sarcophagus of Aha-nakht at El Bersheh.

The radiocarbon date should have been older than the assigned date of this XIIIth Dynasty sarcophagus. Instead, the Biblical date for the dynasty fits in well with the C14 date. The wood was about a century old when it was cut.

Source: Data from *Radiocarbon Supplement*, (1959).

A-220	XII	3840±150	1890	1992-1786	1892-1680
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Wood from large plank from an El Borshen tomb dating to the Twelfth Dynasty.

Here is a case where the Bible and history were already approximately reconciled. The C14 date for the XIIth Dynasty, therefore, falls within the limits of both systems of chronology.

Lv-93	XXII	2750±210	800	1000-750	750
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Wood from the lid of an Egyptian mummiform coffin from Deir el Bahari. The style of the coffin suggests a date between 1000 and 750 B.C.

This is another time when the Bible and history were not in disagreement to begin with. It is important in these cases to realize that all three can be in agreement.

Source: Data from *Radiocarbon Supplement*, (1962).

TABLE I (Continued)

Sample No.	Dynasty	C14 Age: (Before Present)	(B.C.)	Accepted Historical Date (B.C.)	Biblical Date (B.C.)
A-334	II ?	4090±50	2140	<i>circa</i> 2690	<i>circa</i> 1990
Charcoal from what is believed to be Dynasty II remains. The wood that was burned and became charcoal must be older than the time to which it is assigned historically. The Biblical date, therefore, is in harmony. The accepted historical age, however, is far too old. That is, when Egyptian history is corrected to conform with events as they occurred and as they are found in the Bible, the dynasties are dated by some five centuries lower than they are presently.					
TF-56	III	3990±110	2040	2700	1737
Acacia wood. The historical date is seven centuries and more too old. Buhen Old Kingdom Series, Sudan. (done by the lab in Arizona):					
A-330		3960±60	2010	2610-2340	1737-1486
A-331		3960±60	2010	2610-2340	1737-1486
A-332		3820±50	1870	2610-2340	1737-1486
All were charcoal samples from copper smelting site at Buhen, Sudan. The site has jar seals with the cartouches of Khafre, Menkaure, Userkaf, Sahure and Niuserre. Historical dates are in error on the order of six centuries. A tree that started to grow about the year 2000 B.C. and was cut around the beginning of the Old Kingdom produced charcoal C14 dates which fit in well with the Bible. With charcoal we do not know whether old or young rings were the parts burnt off. Source: <i>Radiocarbon Supplement</i> , (1963).					
A-434	XII	3560±50	1610	1992-1786	1892-1680
A reinforcing timber built into the north girdle wall about 50 cm. above the present ground level, fortress of Askut. The Biblical figures are closer than the historical.					
A-433	XII	3670±60	1720	1992-1786	1892-1680
A reinforcing timber built into the wall of the Semna I fortress in the Sudan. The timber was 100 cm. above ground level in the west portal of the northern fortress. Estimated age is the time of Sesostri III, <i>circa</i> 1872 B.C. The Biblical age is closer than that of the historical.					
R-35	Middle Kingdom	3880±80	1930	2000-1750	2035-1680
Fragment of wooden basket classified as belonging to the Middle Kingdom. Source: <i>Radiocarbon Supplement</i> , (1964).					
UCLA-739	I	4265±80	2315	3100-2900	2254-1993
Linen found in mastaba 2050 at Tarkhan by Petrie in 1914 and considered by I.E.S. Edwards to be Dynasty I.					
UCLA-900	XII	3640±80	1690	1870	1778
Deckboard from funerary ship of Sesostri III.					
P-717	XVIII	3111±59	1161	1500-1370	970-870
Charcoal from Tomb 12. Estimated time is Thutmose III - Amenhotep III. These data are obvious in their implications. The Bible is correct and C14 dating substantiates scripture. Egyptian history should be corrected in accordance with the Bible and science.					
P-718	XVIII	3087±59	1137	1408-1372	870
Charcoal from burial chamber of tomb which is archaeologically dated to the reign of Amenophis III.					
P-726	XVIII	2980±50	1030	1343	840
Pieces of <i>Cedrus libani</i> and <i>Zizyphus spina</i> from coffin of Tutankhamon, Valley of the Kings.					
P-720	XVIII	2981±58	1031	1370-1314	840-800
Wood from sacrophagus found in underground chamber of Tomb 37, no. 9, end of Dynasty XVIII.					
R-36	XIX	2950±45	1000	1300-1235	832-773
Well-preserved sycamore wood fragment from an anonymous tomb, Thebes, Valley of the Queens. Estimated time of Ramesses II. Source: <i>Radiocarbon Supplement</i> , (1965).					

TABLE I (Continued)

Sample No.	Dynasty	C14 Age: (Before Present)	(B.C.)	Accepted Historical Date (B.C.)	Biblical Date (B.C.)
A-569	I	4200±90	2250	3100-2900	2254-1993
Same sample used in UCLA-739.					
A-520	IV	3720±80	1770	2600-2480	1750-1626
Charcoal Pit 1, level 2. Source: <i>Radiocarbon Supplement</i> , (1966).					
UCLA-1201	I	4290±60	2340	3100-3000	2100-2050
Reed matting remains used as brick course bonding on north side of superstructure of Tomb 3503 (Mer-Neit), Archaic Cemetery, Sakkara. Sealed archaeologically according to Martin of Cambridge University.					
UCLA-1202	I	4235±60	2285	3000	2100
Reed matting from the south side of superstructure of Tomb 3035 belonging to Hemaka at Sakkara's Archaic Cemetery.					
UCLA-1203	I	4140±60	2190	2900	2100
Reed matting found in the inner enclosure wall of the west side of Tomb 3505 at Sakkara.					
UCLA-1212	XII	3500±60	1550	1897-1877	1798-1779
Plant remains of reed matting used as bonding found in pyramid of Sesostris II at El-Lahun. Source: <i>Radiocarbon Supplement</i> , (1967).					
Birm-20	I	4224±97	2274	3100-2900	2254-1993
		4206±68	2256	(same)	(same)
Same sample was tested in UCLA-739, A-569, NPL-5 and Burleigh. Tarkhan linen discovered by Petrie. Note the remarkable similarity between the Bible and both determinations for this Dynasty I material. Source: <i>Radiocarbon Supplement</i> , (1968).					
BM-203	I	4150±110	2200	3100-2900	2254-1993
Same sample of Tarkhan linen as reviewed in the previous specimen.					
BM-248	I	4160±110	2210	3100-2900	2254-1993
Same as above. Note the precision with which the dating of the same sample yields dates which confirm the Bible and Dr. Hoeh.					
BM-231	I	4270±65	2320	2900	2100
Reed used as bonding in Tomb 3505.					
BM-233	III	4000±65	2050	2675	1737
Same as the previous sample, only taken from Tomb 3030 and estimated to be from the early IIIrd Dynasty, circa 2675.					
BM-234	III	3790±65	1840	2650	1737
Acacia wood from Tomb 3510.					
BM-236	III	3840±65	1890	2550	1737
Linen from Dynasty III tombs #3508 and #3510.					
BM-237	IV	3720±110	1770	2550	1750
Human collagen from Tomb 3508 and 3510. Source: <i>Radiocarbon Supplement</i> , (1969).					
UCLA-1413	XI	3770±60	1935	2000-1900	2000-1890
Wood fragment from a bow and thought to be of the XIth Dynasty. Source: "Ancient Egyptian Radiocarbon Chronology," <i>Philosophical Transactions of the Royal Society</i> . R. Berger, 1970. A, 269, pp. 23-36. Tomb of Wadji (Dynasty I, circa 3025), three wood samples:					
BM-319	I	4225±70	2275	3025	2100
BM-320	I	4206±80	2256	3025	2100
BM-322	I	4349±70	2399	3025	2100

There is good comparison between the three tests made by the British Museum. It should be apparent to the reader that as the techniques have improved so has the close similarity between Biblical chronology and C14 dating. The wood was several hundred years old before it was cut to

TABLE I (Continued)

Sample No.	Dynasty	C14 Age: (Before Present)	(B.C.)	Accepted Historical Date (B.C.)	Biblical Date (B.C.)
be used in this Dynasty I tomb. For the accepted historical scheme to be valid, the C14 dates would have to have been older than 3025 B.C.					
BM-323	I	4342±70	2392	<i>circa</i> 3000	2100
Acacia wood from mastaba of the nobleman, Hemaka (reign of Udimu) at Sakkara.					
BM-324	IV	3974±70	2024	2600	1750
Wood samples from southern pyramid of Snefru at Dahshur.					
BM-325	IV	3852±80	1902	2600	1750
Cypress wood from upper chamber of southern pyramid of Snefru.					
BM-331	VI	3770±85	1820	2350	1614
Pine wood, outermost rings of large beam supporting royal sarcophagus of Teti.					
BM-511	XVIII	2972±60	1022	1450	1030
Pine wood from sarcophagus of tomb 3518, Sakkara. The sample dates from the mid-XVIIIth Dynasty—based on Cypriote-Base ring I juglet.					
BM-512	XVIII	2910±50	960	1450	1030
Dom palms nut shells found in tomb 3518, Sakkara.					
BM-333	XIX	2940±100	990	1290-1224	834-773
Reed used as bonding between mud brick courses from storage magazine in NW corner of Ramasseum, Thebes (funerary temple of Ramesses II).					
BM-336	XIX	2890±100	940	1214-1208	696-690
Reed used as bonding in pyramid-chapel of Tjanefer, third prophet of Amun at Thebes (reign of Seti II).					
BM-340	XXX	2310±80	360	380-363	379-361
Reed matting used as bonding found in Great Temple of Amun, Karnak. Brick stamp bears Nectanebo I's name.					
When history and the Bible agree they are both confirmed by C14 dating.					
Source: <i>Radiocarbon Supplement</i> , (1971, #2).					

time and location on the earth.⁸ This strikes at one of the supporting pillars of this dating method. The facts became known to de Vries when he dated by radiocarbon method certain tree rings from timbers found in European buildings whose date of construction were absolutely sealed to a particular year. Deviations in the C14 activity in the atmosphere around 1700 A.D. were proven to exist. Searching for the cause of this phenomena, de Vries proposed that the fluctuations in C14 were related to climatic conditions.

Within a short period of time other investigators found the same trend in dating tree rings. In 1960, Willis, Tauber and Münnich stated that their findings resulted in general correspondence with the curve obtained by de Vries for the period of the last 300 years.⁹ Their study was made in three European laboratories on sections of California *Sequoia gigantea*.

Further research reinforced the fact that there were variations in the concentration of C14. In 1961, Stuiver expressed the feeling that there was an inverse correlation between C14 activity and the number of sunspots during a particular time.

Stuiver and Suess, in 1966, were able to describe part of the problem as follows: "... The production rate of C14 by cosmic rays undergoes large variations because of a modulation of the galactic cosmic ray flux by the sun."¹⁰ In addition, Stuiver and Suess noted that there were indications that the dipole moment of the earth had changed over the last 6000 years.

Problems Discovered

In 1965, Suess obtained 150 wood samples, dated by dendrochronology, from Dr. Huber of the Forest-Botany Institute in Munich and Dr. Ferguson of the Arizona Tree-Ring Laboratory. The wood, which included European oak, American fir, Hitchcock and sequoia, covered the centuries after Christ. Research established that the C14 dates did not correspond to the tree-ring ages. Reasons for this were thought to derive from: changes in the atmospheric C14 reservoir, sunspot numbers as they cause changes in cosmic ray intensity, and changes in the C14 oceanic reservoir.¹¹

In reference to sunspot numbers, Schove made a study of sunspot cycles from B.C. 649-2000 A.D. He concluded that C14 in atmospheric carbon

dioxide increased when there were periods of low solar activity. When there were large numbers of sunspots the atmospheric C14 decreased.¹² We cannot, however, deduce from this that ancient Egyptian materials were necessarily affected since the study only covered an area back to 649 B.C.

The Suess Curve

Physicists continued to struggle for a reconciliation with historical dating. By 1969, Suess had measured the carbon 14 activity of dendrochronologically dated bristlecone pine tree-rings which had calendrical dates reaching back to the third millennium B.C. He used the data to derive a "Suess calibration curve" which plotted true age against radiocarbon dated dendrochronologically dated bristlecone pine tree-rings. This enabled geophysicists to change dates, which appeared to be too young due to an evolutionary approach in the magnitude of centuries.

Thus, the Egyptian dates were made to seem older than the actual precalibrated determinations. With this development some felt that history and physics were finally reconciled. An examination of Table II will show that this is not true. Calibrated dates based on Suess's curve are still too young to match the evolutionary Egyptian time-scale.

Since the Egyptian material, which Egyptologists claimed to be irrevocably established and dated by "astronomical" calculations, did not render correspondence with the dating of the identical material by C14 dating, researchers sought datable substances found in the natural environment with an age parallel to the antiquity of Egypt. Discrepancies between "set" Egyptian dates and C14 dates meant that, either Egyptian chronology was not properly constructed, or the C14 method was not sufficiently precise for historical purposes.

Discovery and investigation showed that *Pinus aristata* grew in ancient times and that its tree-rings could be counted. Calendar dates or B.C. years were assigned to specific rings after the tree-rings were counted. These wooden rings were then dated through the radiocarbon technique. Suess made a graphic plot of the data: the C14 age of the tree-rings (dated previously by dendrochronology) as opposed to the actual calendar age of the same tree-rings derived from counting the rings. It was then theorized that the curve drawn through the points makes possible the correction of C14 dates. Tree-rings revealed the changing amounts of C14 available for absorption during any particular year.

For recent centuries the quantity of C14 absorbed by a tree-ring rendered a C14 age, after analysis, which corresponded to the true or dendrochronologically dated ring. To illustrate the

point further, however, a tree-ring count equivalent to 2000 B.C. would, according to pre-Suess curve theory, relate a C14 age in the vicinity of 2000 B.C. This did not prove to be true. In general, Suess demonstrated that the C14 age of a tree-ring was not the same as the calendar or true age of the identical ring.

The Suess curve makes it quite clear that the amount of C14 in the ecosystems of the earth has not remained static over time. For the most part modern tree-rings have C14 ages which correspond closely to true age.

Deviation between true and C14 ages increases as we retrogress in time. For example, Arizona laboratory bristlecone pine sample 1031 was tree-ring counted and given a date of 4275 B.C. When this same ring portion was dated by radiocarbon the resulting age was 3425 ± 29 B.C. In this case there is an eight and one-half century difference. Likewise, Arizona bristlecone pine sample 736 was counted and was assigned an age of 3000 B.C. Radiocarbon analysis rendered an age of 2363 ± 64 B.C. The difference between true or calendar age and the C14 age was 637 years.¹³

Therefore, according to the theory, a C14 date is lower than the actual age. Carbon 14 dates are made to appear to be older than they really are through use of the Suess calibration curve. Geophysicists concluded that the quantitative difference between true age and C14 age of bristlecone pine tree-rings was the same quantitative difference between "astronomical" ages and C14 dates for Egyptian material.

Therefore, just as a tree-ring with a calendar age of 3000 B.C. should have related a C14 date of 3000 B.C. (in accordance with pre-Suess theory), but did not, and rather rendered an age of 2363 B.C., so an Egyptian artifact assigned an age of 2363 B.C. by C14 would now have the same quantitative relationship between true and C14 ages as that related by the *Pinus aristata* tree-rings.

An Egyptian object might have been carbon dated in the area of 2363 B.C. This is radiocarbon years and not true age (if the Suess curve is applicable to Egypt). To find the true age the Suess calibration curve is used which demonstrates (or so the theory proposes) that the calendar age of a C14 date of 2363 B.C. is actually 3000 B.C. The radioactive carbon 14 in the atmosphere in 3000 B.C. was much higher than the amount expected, due to changes in the geomagnetic field, galactic cosmic ray flux, etc. An object which came from the time of 3000 B.C. would C14 date and produce a figure of 2363 B.C.

A C14 date of 2363 B.C. mirrors the amount of C14 available to bristlecone pine tree-rings in 3000 B.C. on the old static C14 atmospheric level theory. Suess calibration is based on the conception that tree-rings, contemporary with an-

cient times, contain the quantity of C14 in the atmosphere for not only California, but also the Near East and around the world.

There must be scientific reasons for the unusually high C14 levels found in the old tree-rings which render low C14 ages. If dipole changes for the geomagnetic field occurred, there would have been variations in the number of cosmic rays which entered the earth's atmosphere. Major alterations in the C14 production would have resulted.

Modulation in the galactic cosmic ray flux is the other major reason offered for this situation of low C14 ages.

Also, radiocarbon chronologists have suggested: the possibility of internal sapwood contamination, *in situ* production of radiocarbon based on bristlecone's nitrogen content over long periods of time and the uncertainty of the actual half life of radiocarbon.¹⁴ Internal sapwood contamination, and *in situ* production of C14 in old rings would have caused high C14 counts in the tree-rings. We must not forget that further studies may prove the need for alteration of the half life.

Calibration

Table II contains the same fifty samples in Table I. In the second table, however, the dates have been arranged by dynasty. The three columns to the right of the sample numbers are: C14 determinations (B.C.) as they were published, accepted historical dates based on an evolutionary and inflated time-scale which is also claimed to be supported by astronomy, and the Suess calibration curve figures derived from the Suess curve chart found in the rear pocket in *Nobel Symposium 12: Radiocarbon Variations and Absolute Chronology*, 1970, edited by Ingrid U. Olsson.

It will be noticed that in some cases the Suess figure covers several hundred years. The reason for this is the nature of the curve itself. A single C14 date when plotted on the curve can appear on multiple calibrated or true dates. As stated by Vogel, "A consequence of the fluctuations in the initial C14 content—the de Vries effect—is that the same radiocarbon date sometimes corresponds to two or three calendar dates."¹⁵

In addition, this curve is not a curvilinear extension in one basic direction, i.e. A.D. to B.C. At some points the curve bends back on itself much like a geologic overthrust. That is why, progression towards increase in C14 dates does not always mean an increase in true or calibrated dates. Two reasons given by geophysicists for this phenomena are (1) erratic changes in the composition of the atmosphere with regard to C14, and (2) changes in the intensity of cosmic rays.

Scientists gathered in Uppsala, Sweden, for the 12th Nobel Symposium, felt that, in general, the Suess curve dates agreed with history. According to Suess, "there are no single radiocarbon dates that are more accurate than the curves shown in . . . my paper."¹⁶ He continued: "I think the curve in my paper is the most detailed and most accurate one at present available. I am very happy that other laboratories have confirmed the general trend."¹⁷

Calibration Fails

Calibrated dates for Dynasties I-VI are still too young for the inflated historical time framework and, of course, too old for the Biblical chronology. If calibration is to verify the historical time system, the figures have to be older than the assigned dates. This is not the case.

In many specimens the growth time for wood has not been considered. The one sigma margin for every C14 date applies to both directions. In a few cases adding one sigma places the calibrated date near the close of the period assigned historically. This factor, however, applies equally well in the opposite direction.

Most calibrations for Dynasty XII and XIII are older than the historical date. Biblical placement of Dynasty XII does not differ by more than a century with inflated history. C14 still corroborates Bible chronology (see Table I). Calibrated values for Dynasty XVIII and XIX are too young in five out of six cases. In order for the Suess calibration to have substantiated accepted historical interpretation, the determinations should have been consistently older. The Bible, accepted history, precalibration and calibrated dates all basically agree for the late periods of Dynasty XXII and XXX. Suess calibration does not end the discrepancies.

The Problems of Calibration

We cannot know that *Pinus aristata*, growing in the White Mountains of California, provides data applicable to organisms living millennia ago on a worldwide basis. As Collis noticed, "now that fluctuations have been observed, it is assumed that they are worldwide . . . that dispersal of newly formed C14 in the atmosphere is so rapid that geographical variations do not exist. . . ."¹⁸ We cannot be certain that the curve plotting true age (calendar age) or dendrochronologically counted tree-rings age against C14 dated dendrochronologically dated tree-rings is valid. Dr. Berger, a close associate of Dr. Libby at UCLA, made the following comment:

Ideally it would be desirable to check Suess's data by measurements carried out with a different species. However, up till now a search for a similar long-lived tree coupled with an environment providing excel-

TABLE II

Sample No.	C14 Date (B.C.)	Historical Date B.C.	Suess Curve Calibration (B.C.)
DYNASTY I:			
UCLA-739	2315 $\pm$ 80	3100-2900	3350-2960
A-569	2250 $\pm$ 90	<i>ibid.</i>	2960
Birm-20	2274 $\pm$ 97	<i>ibid.</i>	2950
BM-203	2200 $\pm$ 110	<i>ibid.</i>	2950-2600
BM-248	2210 $\pm$ 110	<i>ibid.</i>	2950-2600
UCLA-1201	2340 $\pm$ 60	3000	2970
P-214	2497 $\pm$ 150	3008 $\pm$ 200	3390-3220
BM-27	2150 $\pm$ 150	<i>ibid.</i>	2950-2560
UCLA-1202	2285 $\pm$ 60	<i>ibid.</i>	2950
BM-231	2320 $\pm$ 65	2900	2960
UCLA-1203	2190 $\pm$ 60	2900	2950-2610
U-4	1890 $\pm$ 150	2810 $\pm$ 100	2480-2210
BM-319	2275 $\pm$ 70	3025	2950
BM-320	2256 $\pm$ 80	3025	2930
BM-322	2399 $\pm$ 70	3025	3350-3005
BM-323	2392 $\pm$ 70	3000	3350-3005
DYNASTY II:			
BM-233	2050 $\pm$ 65	2675	2500
A-334	2140 $\pm$ 50	2690	2950-2550
DYNASTY III:			
C-1	2029 $\pm$ 350	2690	2500
TF-56	2040 $\pm$ 110	2690	2490
BM-234	1840 $\pm$ 65	2650	2190
BM-236	1890 $\pm$ 65	2550	2480-2210
DYNASTY IV:			
BM-324	2024 $\pm$ 70	2600	2490
BM-325	1902 $\pm$ 80	2600	2480-2230
BM-237	1770 $\pm$ 110	2550	2170
A-520	1770 $\pm$ 80	2617-2500	2170
P-216	2132 $\pm$ 102	2708	2950-2550
DYNASTY V:			
A-330	2010 $\pm$ 60	2610-2340	2490
A-331	2010 $\pm$ 60	2610-2340	2490
A-332	1870 $\pm$ 50	2610-2340	2370-2190
DYNASTY VI:			
BM-331	1820 $\pm$ 85	2350	2180
DYNASTY XI:			
UCLA-1413	1935 $\pm$ 60	2100	2480-2390
DYNASTY XII:			
R-35	1930 $\pm$ 80	2100-1780	2480-2390
A-220	1890 $\pm$ 150	2000-1800	2480-2210
UCLA-1212	1550 $\pm$ 60	1897-1877	2030-1760
C-81	1671 $\pm$ 180	1831	2120

TABLE II (Continued)

Sample No.	C14 Date (B.C.)	Historical Date B.C.	Suess Curve Calibration (B.C.)
UCLA-900	1690±80	1870	2120
A-434	1610±50	1992-1786	2090
A-433	1720±60	1992-1786	2130
DYNASTY XIII:			
P-11	1760±98	1858	2160
DYNASTY XVIII:			
BM-511	1022±60	1450	1310
BM-512	960±50	1450	1210
P-726	1030±50	1343	1312
P-717	1161±59	1500-1370	1470
P-718	1137±59	1408-1372	1460
P-720	1031±58	1370-1314	1310
DYNASTY XIX:			
R-36	1000±40	1300-1235	1310-1220
BM-333	990±100	1290-1224	1310-1220
BM-336	940±100	1214-1208	1210-1110
DYNASTY XXII:			
Lv-93	800±210	1000-750	940-870
DYNASTY XXX:			
BM-340	360±80	380-363	420

lent preservation conditions for fallen logs has failed to be successful.¹⁹

Therefore, only one species provides measurements for the period of ancient Egypt. Too much emphasis can be placed on one isolated species peculiar to its own environment.

The Kauri Tree

Fortunately, another species has been analyzed for part of the A.D. period and compared with the *Pinus aristata* results. The important southern hemisphere run was made by Jansen on the New Zealand kauri tree (*Agathis australis*). "Unfortunately," according to Shawcross, "the New Zealand run reported by Jansen shows serious divergence not only from the calendar scale but also from the results obtained by the northern hemisphere laboratories."²⁰

New Zealand radiocarbon chronologists have studied a single kauri tree whose age dates back to circa A.D. 1000. The earliest tree-rings relate dates which are, on an average, 100 years older than the Northern Hemisphere results with *Pinus aristata* for the same period. That is, kauri still demonstrate that C14 ages even at A.D. 1000 are younger than true age, but not nearly as young in comparison to the youth rendered by bristlecone. This demolishes the theory on which the

Suess curve rests. There are geographical variations of C14 for the same year.

That both kauri and bristlecone C14 ages are younger than true age, but not in the same degree may mean that the rings have not been properly counted. Or, if the count was precise, the geographical determinants in the Southern Hemisphere may have produced a curve different from that developed by Suess for bristlecone. Since this was a recent age study, there is no proof that the count was not exact. The point is that geography affects C14 variations.

If there is this degree of difference only 950 years ago, there is no way of predicting the differences between kauri and bristlecone during the eras of importance with relation to the Egyptian past. This situation does not inspire confidence in the Suess curve. Furthermore, kauri calibration can in no way serve to support bristlecone's calibration for Egypt because the kauri only began to grow in A.D. 1000.

Why does the kauri analysis expose a discrepancy? Proportionally lower C14 quantities in the Southern Hemisphere may be the result of the 40% greater oceanic surface in that hemisphere and the strong winds between 40° S and 50° S latitude. With more ocean surface there is greater exchange between atmospheric carbon

dioxide and the surface bicarbonate. The fact still remains that geographical situations change C14 variations and that these factors must be known for a particular area before a calibration curve is used to "correct" C14 dates. Therefore, any curve which attempts to "correct" Egyptian dates will of necessity have to originate from Egyptian tree-rings.

Why didn't trees living at the same time in the A.D. centuries, but geographically separate, produce the same measure of C14 activity in the atmosphere? Collis observed that:

The peculiarity of the New Zealand sequence was explained as due to volcanic activity in the area (a factor in the Aegean as well) while . . . Suess suggested . . . perhaps direct solar radiation on the bristlecone pine, thus producing high C14 counts, and even that the "dead" tree rings were absorbing C14 after death. In this last case, perhaps the half-life of C14 can be affected.²¹

Collis made it clear that more knowledge regarding regional effects had to be attained before conclusions were possible. It does not follow that trees in the White Mountains or the kauri grew under the exact same conditions as organisms in ancient Egypt.

A variety of reasons have been offered to describe the problem. Suess suggested, as did Lal, that there is an altitudinal factor involved in absorption of C14. No city in ancient Egypt was at the same altitude as the White Mountains. Berger also recognized that, ". . . bristlecone pine wood exposed at high elevations may suffer *in situ* production of radiocarbon based on its nitrogen content over long periods of time."²² Now, it is being suggested, that there is absorption of C14 after the "death" of the "annual" tree-ring growth. In addition, Berger stated that the reason the *Pinus aristata* calibration curve does not reconcile with history is the possibility of internal sapwood contamination.

Jansen, on another point, felt, "changes in the movement of the vertical oceanic currents may lead to C14/C12 changes which could . . . affect local areas. . . ."²³ Shawcross believes that there are differences in relative proportions of atmospheric radiocarbon in the two hemispheres and that there is a considerable time lag before any equilibrium is achieved.

Other Tree Studies

Japanese trees have been studied and compared with other Northern Hemisphere trees (European and American). Research has revealed a 40 to 80 year difference between their C14 ages on contemporary tree-rings. The Japanese trees, like the kauri, show an age that is older than the C14 bristlecone tree-ring age. It is of interest that trees other than bristlecone render C14 ages

that are closer to true age. This proves that the variations are not only latitudinal, but also longitudinal.

In addition, the longitudinal variation is not on the same order. Location in the same hemisphere has a bearing on secular variations. Reasons suggested for these lower concentrations of C14 are (1) dominance of oceanic air masses and (2) greater exchange between atmospheric CO₂ and marine surface bicarbonate. Again, here is proof of the significance of geographical coordinates on C14 variations.

A Neolithic tree-ring sequence from Auvernier, Switzerland, has been compared with *Pinus aristata*. Results were reviewed by Collis, who stated that, ". . . again there seems to be a local factor, either that the bristlecone pine curve is not relevant, or that something causes unusually high readings in California and low in Switzerland."²⁴ It will be necessary for more low altitude species to be checked before anything like a calibration curve can be reached.

At the Twelfth Nobel Symposium in 1969, Jansen reported that trees from Australia and New Zealand differ considerably from European and North American measurements. Jansen stated that one ". . . explanation is that atmospheric radiocarbon has indeed been distributed in a very inhomogeneous fashion in the past."²⁵ Lerman, *et. al.*, believe that the difference between the hemispheres may be ". . . based on the latitudinal distribution of the C14 input into the atmosphere and of the exchange with the marine carbon reservoir."²⁶

In a quite recent study, Baxter and Walton have shown fluctuations in C14 concentrations and variations in atmospheric mixing.²⁷ From their evidence, these men deduce a rate of injection of stratospheric C14 into the troposphere which increases during certain periods of solar maximum. In addition, it was found that stratospheric residence time can be significantly shorter, by as much as one year, than subsequent measurements.

Suess made an assumption when he created the curve. In his own words, "the validity of these curves and tables is based on the assumption that wood and other plant material grown at the same time show the same radiocarbon content, independently of their geographic place of origin."²⁸ The assumption has been proven false.

Conclusions

Application of the Suess curve drawn on the basis of radiocarbon dated dendrochronologically dated tree-rings to areas other than the location where the tree-rings grew is based on the false conception that there are no geographical factors influencing the secular variations of C14. All

C14 dates cannot be "corrected" by this curve. There are geographical elements unique to every area as demonstrated by the kauri and Japanese runs.

Unknown is the nature of the physical elements which would produce a curve peculiar to the particular geographical orientation of Egypt. There are no trees in Egypt which began growth in ancient times. Besides this fact, there is Suess's own admission that the curve is quite uncertain and that deviations on the order of 200 years are possible.²⁹

Biblical chronology, corrected ancient Egyptian history and C14 dating without calibration agree. Inflated, evolutionary and so-called "astronomically" based Egyptian history does not agree with radiocarbon dating even after it is calibrated on the Suess curve. Egyptian history should be corrected.

Bible chronology before the Flood is not in agreement with C14 dating. Further refinements and qualifications will probably produce even better correlation between the Bible and C14 dating. The number of factors which are now known to influence C14 dating may explain the

errors and inflated chronologies for the Palaeo-, Meso-, Neo- and some Chalcolithic archaeological remains before the Flood.

If a large percentage of cosmic radiation was shielded from the earth by a canopy before the Noachian Deluge, then organisms living during the time from Creation to the Flood would have a C14 date much earlier than an actual historical date. Scientists must account for this as well as the lingering effects after the Flood in their computations. Their discoveries indicate that there were catastrophes and a major change in the C14 oceanic reservoir. By admitting the fact that a Flood did occur, physical explanations of scientific data are facilitated.

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THE GENESIS KINDS AND HYBRIDIZATION: HAS MAN EVER CROSSED WITH ANY ANIMAL?*

FRANK L. MARSH**

In the opinion of some, basic types of organisms have hybridized in the past, and certain modern races of men have resulted from a man-beast cross. A review of pertinent literature shows that it abounds with unreliable reports on the crossing of plants and of animals. With regard to man, modern anthropologists and geneticists agree in the opinion that human beings have never crossed with any animal.

Genetically the morphological differences between two basic types of organisms result from their different DNA's. The pattern of the nucleotides in the hereditary material determines the basic type of the organism. In order to hybridize, individuals must have the same general DNA pattern. All relevant laboratory data indicate that if the general DNA patterns are different, then a chemical incompatibility exists between these basic types which makes true fertilization, and resultantly hybridization, impossible.

In the light of modern findings, the fact that, according to Genesis 1 and 2, all basic types existing on the earth have been present since creation week, guarantees to Bible believers that every basic type of organism, including the human type, is 100% pure type in all its generations.

Introduction

Numberless written biological excursions into the wonderful realm of living plants and animals are possible, but the purpose of this discussion is to inquire into the problem of the extent to which hybridization can occur among basic types of organisms. Specifically, the goal before us here is to acquaint ourselves with the possibility or impossibility that man has ever formed a hybrid with any animal.

If a man has crossed with a beast and thereby produced a new race, some theological implications would immediately appear. Would the hybrid race have souls to be saved? Would such a race be included among those for whom Christ died? If they did appear and were included, then did Christ die in part to redeem animals? By crossing with men, could animals share in the plan of salvation? But before we get lost in speculation, what are the pertinent revealed and natural facts about hybridizing (sometimes called amalgamation) among basic types?

Records Examined

One might say, "Well, that will be easy! Just go to the records." But only he who has gone to the records knows how soon such an inquirer is immersed in general confusion, even in the accounts given by assumedly reputable naturalists. Likewise in recent times have you heard that the grapefruit is a cross between a grape and either an orange or lemon, and that the wobbie is reported to be a hybrid between a carrot and a beet¹—and on among plants until the false tales number almost *ad infinitum*?

With animals the reports are just as unreliable. Did you see in letters to the editor of *Time*,² a photograph of what was said to be a cross between a hare and a grouse-like bird, the capercailzie; and on the front page of *The Denver Post*,³ the photo of what was said to be a cross between a Persian-Angora cat and a Pekinese dog; and in the *Live Stock Journal*,⁴ did you read about the reported cross between pigs and sheep? And did you read in *Science and Scripture*,⁵ about what has been done with cloning by Stanford's Lederberg, and of resulting surmizings which even included the prediction of a coming day when entire sub-human parts and even whole animals may be made to order?

During my many years of teaching college biology, I was told confidentially at various times by a number of students, of cases they had *heard about* where man and animal had produced a hybrid. However, I will insert briefly at this point, the fact that modern reputable geneticists agree that all these reports are completely groundless.

With this mingling of hearsay, gossip, imagination, inaccurate reporting, and efforts toward practical jokes, we find the records in a bad state of confusion even in modern times. What can we expect from earlier times, or even during the early days of our scientific age? Wild untruths were abundant and repeated for fact during the superstitious times of the Dark Ages when witchcraft and misinformation about nature abounded. During those days it was commonly considered to be possible for man to cross with beast.

We can only wish that the changes accompanying the Renaissance and the shift to the inductive method of reasoning had cleared all such unfounded accounts from the record. An illustration of the confusion among scientists of some over a century ago on the subject of crossing, is

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furnished by the report of Samuel G. Morton, M.D., read before the Academy of Natural Sciences in Philadelphia in 1846, in which he fantastically, but soberly, records the production of offspring from a natural bull x sheep cross.⁶

It is of special interest to read the word picture which Uriah Smith gave of the beliefs of naturalists of the early 1800's with regard to the extent of crossing of man with beast. In his small booklet which commonly goes by the name of "Objections Answered," 1868, Smith wrote,

Moreover, naturalists affirm that the line of demarkation between the human and animal races is lost in confusion. It is impossible, as they affirm, to tell just where the human ends and the animal begins. . . . Whatever races of men we may take, Bushmen, Hottentots, Patagonians, (and on page 103, Digger Indians of the United States), or any class of people, however low they may apparently be in the scale of humanity, their mental capabilities are in every instance the basis on which we are to work, and by which we determine whether they are subjects of moral government or not.⁷

If this opinion of the naturalists in Smith's day regarding crossing were a correct picture, the "human" race would indeed present a perplexing problem for the personal worker. Which man had a soul and which was a soulless animal? Would the gospel commission urge the believer through steaming and dangerous jungles to bring the good news to a population of "men" who had no souls to save?

We are glad to be able to report that anthropologists, after over a century of study of these less civilized races since Smith's day, are now united in their opinion that every living race or breed of man is *entirely human*, having no mingled "blood" with the beasts. Of course the evolutionists hold that man developed upward through the beasts. But even they agree that *after he became a man* he has never been able to cross (back) with any animal. The special creationist is happy to *know* that *all* of man's ancestors have been human beings, and that all modern men are bona fide descendants of Adam who was the son of God (Luke 3:38).

Positions of Geneticists, Medical Scientists

The testimony on man's crossability, the unanimous opinion of all reputable genetic scientists, is exemplified by the geneticist E. C. Colin in the following words: "In ancient times various superstitious beliefs grew up around double monsters; some people even maintained that they were the hybrid offspring of man with some other mammal (hairy animal). As a matter of fact, there is no evidence of the origin of a hybrid between man and any other mammal."⁸

Colin has laid his finger on what was generally the origin of stories of man-beast crossing. By the geneticist, any offspring which is in any way abnormal in appearance is often referred to as a "monster." "Monster" in these cases does not necessarily refer to a dragon-like beast, but merely to a new-born which shows a variance in appearance from the normal. We will not agree with Pliny who said, "Nature created monsters for the purpose of astonishing us and amusing herself," but we do recognize the sad and not infrequent occurrence at birth of deformed infants.

Medical scientists believe that these malformations result from developmental failure, arrest, or excess, and from fusion or splitting and displacement before birth. However, in olden times before genetic and medical knowledge had hardly begun to accumulate, if the malformed infant in appearance gave some farfetched suggestion of a dog, for example, tongues began to wag that there had been an affair with a dog. Or if the malformed did not suggest some animal, then it was thought that either some witch in the neighborhood had cast a spell over the prospective mother, or that she herself was possessed of an evil spirit.

Through the centuries, as folk have become acquainted with numerous strange and wild accounts of assumed man-beast crosses, it is not surprising that eventually even some intelligent folk have almost unconsciously followed along in that direction in their own thoughts. The man-beast-cross fallacy has been more or less inherited from the past, and resultingly, confusion at even high levels on this point is not uncommon today. It is appropriate that we examine this problem and discover as many pertinent facts as space allows. For convenience we will divide the subject under these headings: (1) In the Scriptures, (2) In nature, (3) Significance of virility, and (4) Uniformity in nature.

(1) In the Scriptures

The account of creation in Genesis 1 and Genesis 2 makes very clear that by the close of creation week the landscape was verdant with plants in all their basic types from lowly carpeting forms to the lofty trees; from the mighty oak to the lichens on its bark, and to the delicate herbaceous forms blossoming prettily at its base.

All kinds of animals swam in the waters, burrowed in the ground, crept, walked, and moved lightly over the land, climbed the trees, and in variable sizes from the insect mote in the sunshine to the giant *Teratornis*, flew through the air. According to the record each of these organisms was created after its kind with a form and structure which, when compared with all

other living things, constituted a discrete, clearly delimited unit in nature.

Reasoning deductively, we ask, "Would an omniscient Creator bring into being all this wonderful plethora of basic types, types manifesting distinctly different morphologies (appearances) and at the same time, make them so similar physiologically (chemically) that they could cross helter-skelter and in a few generations erase the beautiful, clear-cut discontinuity of diversity?"

Verses in Genesis

The answer to this question is found in Genesis 1:11, 12. But in the KJV of the Hebrew Holy Bible, these two verses are sufficiently ambiguous to permit doubt to be cast upon any reference being made here to the reproductive behavior of plants. In this version it might be concluded that only reference to differences in appearance is made, that is, the reference is purely taxonomic.

However, in more recent translations this ambiguity vanishes as we read, Genesis 1:12 RSV: "The earth brought forth vegetation, *plants yielding seed according to their own kinds*, and trees bearing fruit in which is their seed, each according to its own kind."⁹ (Emphasis added); and NEB: "So it was; the earth yielded fresh growth, *plants bearing seed according to their kind and trees bearing fruit each with seed according to its kind*."¹⁰ (Emphasis added)

Kenneth N. Taylor expresses the thought of Genesis 1:11, 12, which is set forth not only in these two translations, but also in the large majority of Bible commentaries when he paraphrases these verses as follows: "And He said, 'Let the earth burst forth with every sort of grass and seed-bearing plant, and fruit trees with seeds inside the fruit, *so that these seeds will produce the kinds of plants and fruits they came from*.' And so it was, and God was pleased."¹¹ (Emphasis added)

In the original Hebrew it will be recognized that Taylor is grammatically correct in his three groups of plants; and he does state the majority opinion of Bible commentators that reproduction is involved, and, among plants, results in offspring which belong to the same kind as their parents. It seems reasonable to assume if such were the case with the plants, so was it true also with the animals. Empirical evidence from the modern scientific laboratory supports such behavior among animals.

To express it mildly, in the light of Genesis 1:12, it is difficult to understand how one basic type could cross with another basic type (as man with a beast) if the law of creation dictated that their reproductive performance was to be such as to bring forth only additional individuals of the same kind as their parents. In the face of

this clear record we dare not say, "Oh yes, generally that was true, but there may have been an occasional exception." Laboratory findings today demonstrate that, *without exception*, basic types are so different in their cellular chemistry as to make a departure from the law of each after its kind physically impossible. Again we get glimpses of the handiwork of an omniscient Creator.

The assertion in Genesis 6:12 RSV, "And God saw the earth, and behold, it was corrupt; for all flesh had corrupted their way upon the earth," was once taken to suggest that possibly a crossing of man and beast is here suggested. However, question is cast upon such speculation when we read Genesis 6:12 NEB: "In his sight the world had become corrupted, for all men had lived corrupt lives on earth." This translation suggests to us that the expression "all flesh" does not necessarily include animals.

It would appear that the only verse in which these versions unitedly and indirectly suggest that in their behavior animals had gone astray from the original intention, is Genesis 6:7. We read in RSV: "And the Lord said, I will blot out man whom I have created from the face of the ground, man and beast and creeping things and birds of the air, for I am sorry I have made them." KJV and NEB agree with RSV in their translations in this verse.

At the close of creation week it is recorded in Genesis 1:31 RSV, "And God saw everything that he had made, and behold, it was very good." So most obviously something had occurred among men and animals during the succeeding sixteen centuries which caused God to declare, at the time of Noah's flood, that He was sorry that He had made them.

Remembering the law of creation which prevented crossing of basic kinds, we could speculate that possibly at the close of creation week variants within created types were distributed over the earth in different ecological habitats, depending on their adaptation to specific temperatures and moisture conditions, so that in the over-all view they presented a beautiful mosaic pattern of geographic distribution. Under stable conditions of environmental factors, these populations would remain isolated in their respective original areas.

However, with the entrance of sin, accompanying temperature and moisture changes would cause these variants within a kind to wander from original habitats, meet other members of their kind, and hybridize to such an extent as completely to confuse and erase the original beautiful pattern of distribution. It seems wise to conclude that whatever had occurred among living things to cause them in the sight of God,

by the time of Noah to deserve annihilation, it probably was not fusion of types.

It is helpful here to bear in mind that among the fossils there is often great variation within kinds, yet at the same time, a prevailing clear-cut discontinuity between kinds. In other words, evidence for the general crossing of basic kinds is absent. Those few forms which suggest an amalgamation of types could well have been created in their respective patterns. At the same time, the confusion of variants *within* basic types could have resulted from an intratypal amalgamation among originally created variants. Thus it is that the fossil evidence serves to substantiate our speculation regarding an original mosaic pattern of ecological variants within created types.

Verses in Leviticus

It has been averred that Leviticus 20:15, 16 RSV, "If a man lies with a beast, he shall be put to death; and you shall kill the beast. If a woman approaches any beast and lies with it, you shall kill the woman and the beast," is proof that in the 13th century B.C. it was possible for man-beast hybrids to result from such intercourse, and the death of the female partner was imposed to prevent the birth of such a creature. However, if that were the case, how shall we understand verse 13 RSV, "If a man lies with a male as with a woman, both of them have committed an abomination; they shall be put to death, their blood is upon them"?

Certainly male-with-male cohabitation could produce no offspring, and yet the partners in this act were to be killed as dead as in the case of a man with a beast. Taylor's paraphrase of Leviticus 18:22-24 may be helpful here: "Homosexuality is absolutely forbidden, for it is an enormous sin. A man shall have no sexual intercourse with any female animal, thus defiling himself; and a woman must never give herself to a male animal, to mate with it; this is a terrible perversion. Do not defile yourselves in any of these ways. . . ."¹¹

We would suggest that in none of these situations is the penalty meted because of possibility of offspring. Rather, those involved have given indication of a greatly debased and immoral state of being and under the Mosaic Law were therefore deserving of death.

Perhaps at this point I should make it very clear that there is a vast difference biologically between *crossing* with a beast and having sexual *intercourse* with a beast. It is common knowledge with a great many folk, and to the shame of the whole race of man, that depraved humans have had, and are having, intercourse with just about every animal on earth with whom such an act is mechanically possible. We are *not* referring alone to this sexual act in our discussion.

Instead, the specific point of our study is, has it ever been possible for man to *cross* with a beast, and by the word "cross" we mean produce man-beast hybrid offspring. The historical fact that certain eastern religions included sexual intercourse with animals is invalid as far as proof for a man-beast cross is concerned. Albeit, the greater the occurrence of these unfruitful human cohabitations with beasts the more conclusive is the inductive evidence against the possibility of a man-beast cross.

Leviticus 19:19 and Deuteronomy 22:9 have been thought by some to suggest that different created kinds could cross. The reading of the pertinent portions of these verses is as follows: Leviticus 19:19 RSV: "You shall not let your cattle breed with a diverse kind: you shall not sow your field with two kinds of seed; nor shall there come upon you a garment of cloth made of two kinds of stuff;" and Deuteronomy 22:9 RSV: "You shall not sow your vineyard with two kinds of seed, lest the whole yield be forfeited to the sanctuary."

In the first place, we must bear in mind that the word "kind" in the Bible does not always refer to the major created kind. For instance, in Leviticus 11:22 RSV the term is applied separately to clusters of individuals as minor as "the locust" and the "bald locust." If the reader feels that these verses in the preceding paragraph suggest the ability of two created major kinds to cross, he should consult the numerous standard Bible commentaries.

Not one of these authorities believes that more than crossing within original kinds is concerned. To illustrate, Adam Clark says that the prohibition against the breeding of cattle with a diverse kind "implies that the horse and the she-ass were not to be permitted to couple" (both are breeds of a single basic type, the horse kind (in the Scriptures the word "cattle" includes in part, cows, horses, goats, sheep, and camels).

These verses are puzzling to commentators. For instance they know that the prohibition notwithstanding, mules were bred in the time of David and Ahab (2 Samuel 18:1; 1 Kings 1:33; 18:5). Commentators suggest that the intent of these verses is probably to teach the lesson of purity. The Israelites were to respect the laws of nature, and there was something unnatural and even irreverent in the crossing of different breeds of stock, and in mingling two kinds of seed in a field and linen and wool in the same garment. The basic truth taught through these regulations may have been that purity in domestic life lies at the root of national prosperity.

(2) In Nature

In earlier portions of this discussion we have already called attention to a number of demon-

strable natural facts which bear upon the problem of the crossability of the basic types of plants and animals. Today natural investigation has proceeded to the point where it is *known* that it is *impossible* to cross the basic kinds, kinds illustrated by men, horses, cows, dogs, cats, oaks, maples, roses, and gladioli. Thus it is that we *know* that, at least since the days of modern science, man has crossed with *no* mammal, in accordance with Colin's statement quoted earlier.

Since the time that such records have been kept, we know that man cannot even cross with apes. Some years ago, while discussing this problem of man-beast cross with the noted geneticist Theodosius Dobzhansky then of Columbia University, he wrote in a personal letter under date of May 31, 1945, that Russian biologists had just completed a more or less all-out attempt to cross man with apes through artificial insemination, but had been entirely unsuccessful. Hybrids did not even begin to develop.

Understandably we find vigorous resistance to the concept of man being an animal. However, in the biological realm all living organisms are classed as either plants or animals. With which category will you identify yourself as a member? I join those who believe it unfitting to call man an animal because of the fact that he was created in the image of God, has the power of conceptual reasoning, and is possessed of a soul to save. Such striking differences from animals should place him in a separate and most unique category.

However, we recognize a great deal of similarity between man and animals, chiefly physiological, but in a broad way there are also many morphological characteristics which are common to both. This is not surprising when we remember Genesis and the fact that both man and beast were made from the same chemical elements, and were given the same basic foodstuffs (See Genesis 2:7, 19; 1:29, 30).

The term "foodstuffs" includes any substances which have food value in the bodies of organisms. Generally speaking, for *all* organisms there are six categories of foods: carbohydrates, fats (lipids), proteins, water, inorganic salts (minerals), and vitamins. Man and beast, as it were, sit down together at the same table.

Importance of DNA

Utilizing the food eaten, men and animals synthesize within their bodies many complex substances. For our purpose here, let us select the synthesized macromolecules called nucleic acids, of which there are two classes, deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). These complex substances are composed of a five-carbon sugar (either deoxyribose or ribose), phosphorous, and several different

nitrogen-containing organic molecules known as purines and pyrimidines.

Taking the word of molecular biologists, it may be almost a startling experience for a person to learn for the first time that DNA constitutes the genetic material of *all* organisms (except where RNA serves instead in certain viruses). And to add to that knowledge that only two purines (always adenine and guanine), and only two pyrimidines (always thymine and cytosine), constitute the key material of this most important hereditary substance, whether in man, elephant, or jellyfish.

To illustrate, in the matter of their hereditary mechanism, the only difference between a man and a mouse is in the longitudinal sequences of these same four nucleotides (always joined adenine to thymine and guanine to cytosine), in the DNA molecule (the gene) in the chromosomes within the nucleus of each cell.

The DNA's in the fused nuclei of the fertilized egg serve as a coded set of building instructions which direct the production of the chemical substances which in turn accomplish the multiplication and differentiation of cells in the embryo in such a way as to build a man or a mouse from the same basic foodstuffs. In man the DNA's are the same in every cell of his body, and the same is true in the mouse, but the DNA's of man are not the same as those of the mouse.

The difference appears to lie in the infinite arrangement of the pairs of nucleotides in longitudinal series in the DNA molecules of the organism. It has been estimated that the number of possible sequences is larger than the number of subatomic particles in the universe. We believe we begin to see the plan the Creator followed as He filled our earth with numberless wonderfully challenging forms of life. (For additional information here see more detailed expositions, for instance, Loewy and Siekevitz.¹²).

The simplicity with complexity in the plan is the amazing part, and we are led to conclude that indeed "chance" alone could never have wrought so perfect a system for the production of like from like in so great a complexity of chemical substances. The handiwork of a Supreme Being, Who to the scientist is an Honest Workman, stands clearly revealed. As sincere truth-seekers in a natural world, we endeavor to think His thoughts after Him.

Compatability Tests Interpreted

That the bodies of man and hairy animals are physiologically quite similar, and yet different, has recently been demonstrated still more fully in the laboratory in experiments which have achieved DNA hybridization. Some interesting tissue cultures have been carried on in which soma (body) cells of various animals are brought

together in a single culture. Some hybridization of DNA has taken place.

One of the most interesting cases of such hybridization occurred when human embryonic lung fibroblasts were grown in the same culture with a strain of mouse fibroblasts. In this association, in some cases, human and mouse chromosomes appeared in the same cell. Albeit from 75 to 95 percent of the human complement or set of chromosomes did not appear in the hybrid cells, and continued growth of the hybrid line resulted in slow elimination of *all* human chromosomes. (For further detail see Weiss and Green¹³ and Rabovsky.¹⁴)

Such cellular behavior shows considerable chemical compatibility between the protoplasm of man and that of the mouse, and still the compatibility is not close enough to permit the two protoplasms to unit in the development of healthy hybrid lung tissue. To the creationist, such behavior in tissue cultures helps corroborate empirically the statements of Genesis which portray man and animals originating from the same materials, the dust of the earth, and sustaining themselves with the same basic foodstuffs, at the command of one Creator.

Does the fact that the arrangement of the *same* four nucleotides constitutes the hereditary mechanism of all plants and animals make it more possible or less possible that man has ever crossed with a beast? Molecular biologists assure us that the DNA's of each basic type of animal are different from those of all other animals. This means that chemical incompatibility exists between the sex cells of all these discrete types and results in failure of fertilization of the egg in all cases except among members of the same type. Man and beast might engage in sexual intercourse but they cannot hybridize.

Does tissue culture data, which demonstrates that a few of the chromosomes of a man can coexist for a few weeks in the same cell with mouse chromosomes, suggest that man has ever crossed with a beast? No!

Up to the present, these data show that man and mouse DNA's are so incompatible as to result in the eventual casting out of the human DNA's.

The formation of a man-beast hybrid would require much more than the tissue-culture results can promise. The infinitely more delicate and finely balanced chemical set-up which must exist between the chromosomes of the male and those of the female in fertilization is a far cry from the short period of coexistence which has occurred *in vitro*. In the cultures only a few chromosomes of man could abide even briefly with those of the mouse.

In fertilization *all* the chromosomes of the male (containing all the male DNA's) must

cooperate compatibly with *all* the female chromosomes (containing all the female DNA's), not only for a short period but throughout the life of the hybrid. To add to the difficulty of hybrid formation, are the common differences in chromosome numbers. Man has 46 chromosomes in each cell while, for example, members of the *Pongidae* family (the man-apes) have more or less than 46. To illustrate, the chimpanzee has 48 and the gibbon 44. All results from tissue cultures constitute negative evidence for the formation of a man-beast hybrid.

Both among living things and among fossils, variation is one of the most universal characteristics. However, as we begin to study variation, we soon discover another universal fact. This is the discontinuity of diversity among plants and animals. Organisms, living or fossil, in their multitudinous varieties cannot be arranged in such a way that there is a continuous unbroken series from simplest in structure to those which are more complex, nor can one variant be traced through a continuous series to a markedly different variant.

Instead, we observe that variation is discontinuous, so that rather than a graded series of individuals we find separate clusters of similar forms, a fact which makes possible, with the greatest ease, to distinguish corn and wheat, violets and windflowers, horses and cows, men and chimpanzees. If either hybridization of kinds or "evolution" of kinds had occurred in nature, this discontinuity would not exist. The difference in form and structure among basic types of organisms, the discontinuity, reproductively constitute bridgeless abysses.

(3) Significance of Virility

Virility as applied to our problem refers to power of procreation and, in males, concerns itself only with numbers of germ cells and length of period of fertility of the male. In other words, it has nothing to do with the crossing of a man with a beast. As far as actual fertilization goes, crossing has to do with the exact matching of the DNA's, and if the DNA's of the partners do not match, twenty million sperms could do no more than one.

Abraham was a virile man in that he fathered six sons after he was well past an age of one hundred years (Genesis 25:1, 2). However, even his great virility would have accomplished nothing in the matter of crossing with an ape. Human DNA-component plus chimpanzee DNA-component = 0.000 hybrids.

(4) Uniformity in Nature

As far as I know, objections of creationists to the idea of uniformity arise only when assumptions of uniformists run counter to the clear as-

sertions of special revelation. There is certainly nothing unscientific or unbliblical in the assumption in biology that the life principles, the natural laws on our earth, have continued in a uniform manner since creation week. In fact, it would seem a reasonable view to hold that harmony between Genesis and present-day nature *depends* upon the *uniformity* of life principles since creation week.

Actually, to assume that life principles which were implemented at creation have *not* prevailed down through the centuries gives encouragement to such inharmonious ideas as spontaneous generation and organic evolution. The cosmos in which we live would quickly become a chaos if these natural laws were capricious. Charles Darwin wandered off into a land of make-believe after he concluded there were no law-bound forces in nature.

Suppose I said to you, "After the flood it is possible that Noah, for very joy in getting out of the ark, leaped right over the 45-foot-high ridgepole of his ponderous structure." Suppose you replied, "But it would have been impossible for a man to jump that high!" Then, suppose I shrugged my shoulders and said, "Oh, I know it isn't possible today, but it just might have been possible then!" Would you think I was a careful and accurate supposer?

Suppose I said to you, "I know it is impossible today for man to cross with any animal, but I still believe that it just might have been possible a long time ago." Then, suppose you reminded me that all basic types of animals have different DNA's, in fact that is why they do not all look alike, and for that very reason crossing of kinds would always have been impossible; in fact the nearer to creation, possibly the more clearly different would have been the DNA's of the basic types. Then, suppose I shrugged my shoulders again and replied, "Oh, yes, but I still believe it just might have happened!" And then you said to me, "But Dr. M. . . .!"—well, you complete the statement.

In conclusion, I will state that it is my opinion that the creationist may (in fact is quite required to) conclude, from a study of both revealed truth and natural truth, that Genesis kinds have never crossed. No man needs to believe that he or any of his fellow men have within their bodies any of the genetic material of animals. Paul declared that God had "made of *one* blood all . . . men

for to dwell on all the face of the earth," (Acts 17:26). This leaves no percentage of ape-men.

The first ancestors of every race of men, no matter how he or she may differ in appearance from Father Adam and Mother Eve, were formed from the dust of the earth (Genesis 2:7), in the image of God (Genesis 1:26, 27), the son (or daughter) of God (Luke 3:38). By virtue of this divine origin, every man and woman may, through acceptance of Christ's gracious gift of His righteousness, be members of the household of God (Ephesians 2:19), and as such, the portals of everlasting bliss stand invitingly open before them (Revelation 22:17)!

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THERMODYNAMICS: A TOOL FOR CREATIONISTS (REVIEW OF RECENT LITERATURE)

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I. Introduction

Thermodynamics is a course that causes many an undergraduate to shudder mentally. The use of odd cycles and strange systems may lead many students to feel that they are exploring an Alice-in-Wonderland world.

To add to these difficulties the approaches to thermodynamics are myriad. One can plunge into the thermodynamics of equilibrium, non-equilibrium, steady state, reversible, irreversible, isolated, closed, or open system processes to name a few.

New books on thermodynamics usually offer fresh approaches to the subject showing the science to be in a state of flux. Also scientists are critically evaluating the science at the present time.¹⁻³ This may lead to even more novel thermodynamic interpretations.

Regardless of the present turmoil, principles of immense scientific importance have been developed in this discipline. That these principles are of tremendous generality and affect all other sciences is obvious from the forementioned varied approaches to and applications of thermodynamics.

Thermodynamics deals with the "mystical" quantity called energy, particularly its possible transformations. Every natural process uses this quantity since it "appears" to be what enables nature to operate. Energy can be defined as the ability to do work without resorting to any mathematics. For further study on the energy concept see references 4-8.

Historically, thermodynamics developed from the study of heat engines and the problems involved in converting heat into mechanical work, which is the basis of most of our modern industrial operations.

The first principle or law of thermodynamics is the conservation of energy. Energy can be neither created nor destroyed: it is transferred from one place to another, or changed into various forms. Some other ways to express this idea are as follows: The loss of energy anywhere is always compensated by an equal gain of energy somewhere else.⁹ If any system is carried through a cycle (the final state being precisely the same as the initial state), then the summation of the work delivered to the surroundings is proportional to the summation of the heat taken from the surroundings.¹⁰ In Robert Mayer's own words,

I therefore hope that I may reckon on the readers' assent when I lay down as an axiomatic truth that, just as in the case of matter so also in the case of force [the then current term for energy], only a transformation but never a creation takes place.¹¹

Or simply, the energy of an isolated system always remains constant.

The second principle or law of thermodynamics is more subtle. There are several different statements of this idea. Each reveals a new aspect of this concept:

Carnot: Given an engine that is reversible and that operates between two fixed temperatures, then no other engine operating between these same temperatures can exceed this engine in efficiency.¹²

Planck: It is impossible to construct any cyclic device that can extract heat from a reservoir and produce no other thermal effects whatever.¹³

Kelvin: It is impossible to construct any cyclic device that can extract useful work from an isothermal system.¹⁴

Clausius: Heat cannot pass spontaneously from a body of lower temperature to a body of higher temperature.¹⁵

Caratheodory: In the neighborhood of any given state of any closed system there exist states which are inaccessible from it along any reversible, adiabatic paths.¹⁶

The entropy in an isolated system is a monotonically increasing function of the time.¹⁷

It is obvious from reading these statements that certain processes are impossible in "nature" and certain natural processes are unidirectional. Thus the second law of thermodynamics, "... epitomizes our experiences with respect to direction taken by thermophysical processes."¹⁸

Actually natural processes tend to go in a direction that leads to degeneration of the system involved.¹⁹ Living and non-living systems tend to wear out, age, break down, or decrease in complexity.

Briefly then, it can be said that conservative and degenerative processes operate in nature.

Looking over the various statements of each principle, one may wonder how these are related to the process of "evolution." First, evolution is taken to be thermophysical process. The sun is supposed to be the driving force for evolution on the earth. It is a process that is active now (i.e. evolution is assumed to be a continual upward process).²⁰ An evolutionist, Sidney Fox, states, "Evolution, however, has put together the small-

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est components; it has proceeded from the simple to the complex."²¹

Evolution is presumably a "creative" process, not conservative or degenerative. Proponents consider molecules-to-man evolution as a building, bettering process. Evolutionists would claim that once something is evolved it can evolve into something better supposedly because of environmental "pressures." Although evolved inorganic and organic entities can be conserved and are subject to degeneration, the prevailing "spirit" of nature is one of evolutionary development.

Thus observable conservation and degeneration (science) conflict with necessary evolutionary betterment (philosophy). It is this conflict that creationists have explored to show the fallaciousness of the molecules-to-man concept as a natural occurrence in a *real* world.

II. Creationist Interpretations of First Law

Since conservation processes operate in nature, creation is finished.²²⁻²³ Thus evolution, as a creative process, is impossible. This has been the basic thrust of creationist arguments spearheaded by the writings of H. M. Morris.²³⁻²⁵ He has provided an excellent Scriptural basis for the First Law of Thermodynamics.²⁴⁻²⁵ A philosophical consequence of the First Law of Thermodynamics, pointed out by writers,²⁶⁻²⁸ is that the universe has, either always been in existence in its present state, or was brought to this state by processes not operating now or by direct acts of creation. Conservation processes can only preserve what is already present. Such processes cannot be used to explain the origin of anything.²⁸⁻²⁹

The uniformitarian hypothesis that the present is the key to the past can be viewed in light of conservation principles.²⁹ Since all present geological processes are not creative, then extrapolation of these processes into the past is a self-contradiction according to Morris. Again conservation process cannot be used to explain origins.

In the realm of astronomy and cosmology the steady state and continuous creation ideas of Hoyle violate the First Law.³⁰⁻³¹ Faith in the continuing creation of matter out of nothing by natural processes has never been observed, but thermodynamic concepts for the evolutionist have never stood in the way of evolutionary necessity!

A plot of energy vs. time for a finite universe according to the First Law is shown in Figure 1.³¹ Barnes³² suggests that this principle came into operation after the origin of mass and energy.

Some members of the Creation Research Society engaged in a brief and unique discussion of the relationship of conservation principles in the physical sciences and "after its kind" biological

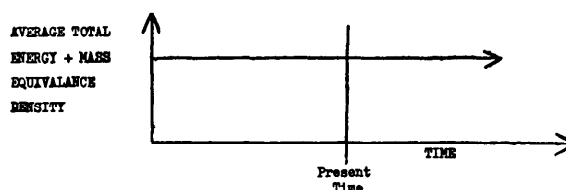


Figure 1. Average energy density versus time. In a finite universe there is the same amount of energy today as there was 1000 years ago and as there will be 1000 years from today, according to the first law of thermodynamics.

conservation. The purpose of the correspondence was to unify the two concepts into a single conservation hypothesis. This reviewer initially asked for comments.³³ Harold Armstrong wrote a brief analysis of the conservation principles from physics.³⁴ Armstrong and Williams³⁵ discussed the need to specify what is meant by order. This may be the key to developing concept. Lammerts³⁶ suggested the following:

Except for degenerative changes and losses (as extinct species) the total number of species determining DNA units now existing is the same as the number originally created. The law of conservation of energy essentially states that the total energy content of the universe remains constant, both inorganically as regards atomic reactions and biologically as regards the inheritance of an original total number of species determining DNA units.

McDowell,³⁷ using information theory concepts, postulated that

The total information implicit in all the bodies (including the total information upon the genes which they carry) of all creatures which are alive upon our planet at any given instant cannot exceed the total information coded upon all the genes which they carry.

Or similarly,

The total information implicit in all of the bodies (including the total information coded upon the genes which they carry) of all creatures which have lived since the original creation, live now; or ever will live upon our planet cannot exceed the total information coded upon all the genes of all of the creatures which came into being at the original creation.

This discussion is still open for comment from others.

Williams approached conservation processes in biology from a qualitative thermodynamic viewpoint.³⁸ Initial-final state methodology was used to illustrate conservation of kinds in living organisms. Figure 2 shows this idea in a simplified manner. This methodology offers possibilities as a way to analyze living systems thermodynamically. The use of this method eliminates

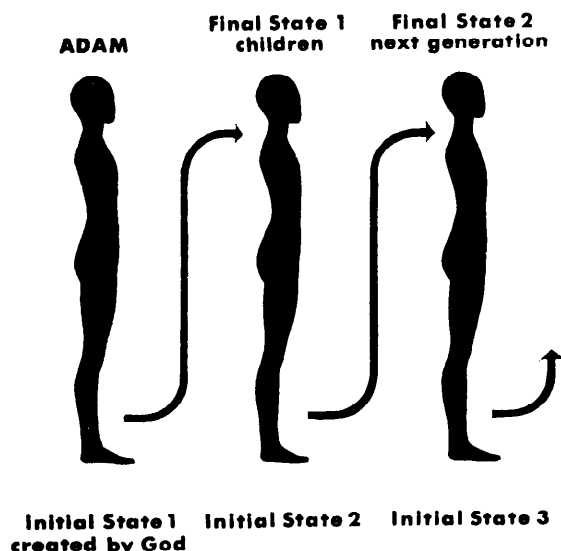


Figure 2. Schematic diagram of reproduction and growth of succeeding generations from initial created state.

the need of evolutionary contrivances to explain the order of living systems in a world of increasing disorder. The creationist approach shows that order can be conserved, although the original order must have appeared by miraculous means.

III. Creationist Interpretations of the Second Law

A. General

The major creationist effort has been in developing applications of the Second Law of thermodynamics. Degenerative processes in nature are opposed to imagined molecules-to-man evolution. This contradiction was first explored by Clark.³⁹ He termed universal natural disordering as the law of morpholysis (to lose form). Morris⁴⁰⁻⁴² developed the concept further and also provided a Scriptural basis for the Second Law.

B. Degenerating Universe

Since the order of the universe appears to be decreasing, it must have been a state of high order at some past time. The analogy used is the unwinding of a clock as it runs down. Some creationists⁴³⁻⁴⁶ interpret this as evidence of a definite creation in the past, the winding up. Also others⁴⁷⁻⁴⁸ have used the phenomenon of increasing disorder to state that the universe is not eternal, for if it were, it would have already run down to complete disorder.

Clark⁴⁹ has an excellent discussion of the application of the Second Law to a finite or infinite universe. The argument is essentially that, if the Second Law applies to all isolated parts of the universe, it will apply also to the whole.

Clark and Williams⁵⁰ in separate treatises have

noted how cautious evolutionary scientists are when prescribing the dictates of the Second Law to the universe, yet proceed with "reckless abandon" when developing an evolutionary origin for the same universe! Williams postulated that the universe can be treated as an isolated system based on Biblical evidence, and not on scientific information.

Mulfinger⁵¹⁻⁵² has applied the Second Law to existing processes in the universe and to supposed evolutionary processes. He claims,⁵² "Every star is a dynamic system undergoing *degenerative* changes." This is based on observational data and runs counter to the evolutionary "propaganda" about the birth of stars. Mulfinger shows thermodynamically that star formation by condensation is impossible; and notes that all known processes in the universe are degenerative.

C. Degenerating Man

Creationists⁵³⁻⁵⁴ claim that man has been degenerating since Adam. One can arrive at this conclusion by consistent application of the Second Law. It should be remembered however that the effects of decay processes have not overridden the stabilizing influence of conservation processes.⁵⁴

Mutations are biological examples of degenerative changes in biological systems. Although mutations are used as a possible mechanism for imagined upward evolution, this claim cannot be substantiated. Reasoning according to the Second Law necessitates that mutations are harmful, and creationists⁵⁵⁻⁶¹ have used this idea effectively. Observational data are on the creationist side in this dispute.

Williams⁶² qualitatively viewed living organisms from a thermodynamic standpoint assuming degenerative processes. Such an approach is possible and dispenses with evolutionary reasoning to circumvent the Second Law where life is concerned. It is interesting to note that scientific facts are fitted easily into a creationist framework.

D. "Chemical Evolution"

One of the required steps in "evolutionary history" is that of chemical upgrading. Smaller atoms "evolve" into larger atoms and molecules. Simpler molecules change into more complicated ones, and finally life spontaneously generates on the proper molecules in a suitable place.

These speculative stages of molecules-to-man evolution are on extremely weak ground scientifically. Here is where normal disordering processes unquestionably "rule" the inorganic and organic worlds. Clark⁶³ recognized that evolution is basically a chemical problem. The experiment done by Miller and Urey⁶⁴ have offered evolutionists their greatest hopes. Scientists⁶⁵⁻⁶⁹

including creationists have been quick to point out the defects of this approach from thermodynamic considerations.

Debate at this level involves the question of open and closed systems. Why do evolutionists insist on open systems? Definite advantages are gained by using open systems. Mass and energy can flow through the boundaries of such a system. When a step is necessary in evolutionary change, an open system can be *imagined* so that an excess of reactants can be added to cause the chemical reaction to proceed drastically to the product side by the well-known LeChatelier principle.

Suppose a reversible reaction, $A + B \rightleftharpoons C$, is possible, but from thermodynamic considerations very little C forms. Assume C is more complex than A or B and is needed in an evolutionary sequence. It can be fabricated in an open system by forcing the reaction to the right by adding an excess of A or B.

But the "evolutionary game" is not finished yet. The product C can be selectively removed from the reaction site, and evolutionists may claim that, in a natural situation, C could diffuse away from the site. More C can form from the reaction than would be expected thermodynamically and huge quantities of the complex compound can be made available.

Thus C is ready for further evolutionary processing thanks to an open system—and *intelligent planning*. Forcing chemical reactions in a preferred direction is one of the latest fads of evolutionists,⁷⁰⁻⁷¹ but the possibility of such a process existing naturally is almost nil.

It is essential to note that brute natural processes do not act this way. Rather natural processes follow the Second Law, which requires that a natural, non-living system drive toward equilibrium, not toward increasing complexity. As Rusch⁷² noted, directed experimentation is all good "clean fun" in a chemistry laboratory or in the mind of the evolutionist, but the laboratory is where it ends.

Another way to avoid Second Law consequences is by imagining a catastrophic event that drives a system far from equilibrium (similar to an explosion). Fluctuations develop that cause the disturbed system to move to a state more ordered than the explosion (metastable state).⁷³⁻⁷⁴ Evolution, then, proceeds supposedly from the new "ordered" state. Again the probability of such happening in a natural situation is slight if not impossible.

Also the order referred to in the new state is questionable. The system must be closely controlled to insure that the proper state rather than total chaos is developed from the transition. Unguided natural processes are not this selective,

and as predicted by the Second Law a disordered state will more likely result.

One stands in awe of the unnatural means evolutionists resort to in order to get their processes to "work in the right way." If something is needed for further evolution, schemes are concocted to provide the necessary material. If evolution needs to follow a particular path, then evolutionists say it does so. Evolution does not thrive on straight science; it needs blessed events.⁷⁵ Scientific miracles are necessary. Why? Simply so evolution can be made to avoid observable degeneration. Evolution from molecules-to-man is more miraculous than creation.

E. Intelligence and Degeneration

The only way to work around natural disordering is to use intelligence. Creationists⁷⁶⁻⁷⁸ have pointed this out, but evolutionists will not be deterred by the realization that natural events will not work like a controlled experiment, or that "evolutionary processes" cannot select their properties or paths as intelligent men can.

F. Evolution and Probability

Probability can be related⁷⁹⁻⁸⁰ to the Second Law by the Boltzmann formulation,

$$S = k \ln w \quad (1)$$

$$\text{or, } dS = k \ln \left(\frac{w_2}{w_1} \right) \quad (2)$$

where S is the entropy of a given state, k is Boltzmann's constant, and w is the possible number of microstates of the given state.

Consider a natural transformation between state 1 and 2 with total possible microstates of w_1 and w_2 respectively. If $w_1 > w_2$, then state 1 has a greater probability of formation than state 2 by the Second Law (because of its higher entropy). If the system goes from state 1 to state 2, then $\left(\frac{w_2}{w_1} \right) < 1$ and entropy decreases (the improbable happens).

Thus every time the improbable occurs the Second Law is violated. The big problem that exists in trying to apply this idea is that it is almost impossible to determine the possible microstates for complicated systems.

Scores of creationists have shown how improbable evolution is. One would expect the probable to happen in nature.⁸¹ If the improbable continually occurs, it would not be considered improbable but probable. To say that evolutionary events are improbable is to say that the chance of their happening is slight. The problem does not end here. Evolution, by its very nature, would have to proceed in a sequence of improbable steps.

For sake of argument, assume the probability of an evolutionary step is 1 in 10^{20} possibilities.

The next evolutionary step necessary to continue the ordering operations would have a probability of 1 in $(10^{20}) \cdot (10^{20})$ or 1 in 10^{40} if both steps have equal probabilities. Connected sequential steps would become phenomenally improbable the further the process goes. An ordering step must be followed by another ordering step, etc. Actually the system would proceed towards disorder (probable occurrence).

This unbelievable sequence of improbable steps may lead a person to ask just how probable is the improbable? The word never is appropriate. Evolution is so improbable that it will never occur; the idea is that if you wait long enough for any event with a finite probability, it will occur. "Long enough" may be never.⁸² A quote of Boltzmann (1898) will help illustrate this.

One should not imagine that two gases, in a 0.1 liter container, initially unmixed, will mix, then again after a few days separate, then mix again, and so forth. On the contrary, one finds . . . that not until a time enormously long compared to $10^{(10^{10})}$ years will there be any noticeable unmixing of the gases. One may recognize that this is practically equivalent to never.⁸³

There is a finite probability that gases can unmix; however it is meaningless because it is so low. Kittel,⁸⁴ has another excellent example of the meaning of never.

It has been said⁸⁵ that "six monkeys, set to strum unintelligently on typewriters for millions of millions of years, would be bound in time to write all the books in the British Museum." This statement is misleading nonsense, for it gives a misleading conclusion about very, very large numbers. Could all the monkeys in the world have typed out a single specified book in the age of the universe?

Suppose that 10^{10} monkeys have been seated at typewriters throughout the age of the universe, 10^{18} sec. This number of monkeys is about three times greater than the present human population of the earth. We suppose that a monkey can hit 10 typewriter keys per second. A typewriter may have 44 keys; we accept lower case letters in place of capital letters. Assuming that Shakespear's *Hamlet* has 10^5 characters, will the monkeys hit upon *Hamlet*?

The probability that any given sequence of 10^5 characters typed at random will come out in the correct sequence (the sequence of *Hamlet*) is

$$\left(\frac{1}{44}\right)^{100,000} = 10^{-164,345}$$

Where we have used $\log 44 = 1.64345$ The probability that a *monkey-Hamlet* will

be typed in the age of the universe is approximately $10^{-164,316}$. The probability of *Hamlet* is therefore zero in any operational sense of an event, so that the original statement at the beginning of the problem is nonsense: one book, much less a library, will never occur in the total literary production of the monkeys.

What happens . . . if we do not specify the title of the book, but agree to accept any known book? There may be about 30×10^6 distinct titles of books: the largest library, the Library of Congress, contains about 15×10^6 books and pamphlets. Note that the total production of the monkeys is equivalent to 10^{24} short volumes of 10^5 characters each, but you will find that none of these duplicate any existing book.

Evolution is statistically as hopeless the the situation just illustrated. When dealing with large numbers nothing but this is to be expected. There is a finite probability that I could stand in Greenville, South Carolina, and throw a baseball to the moon. But, how many evolutionists would wager a month's salary that I would accomplish the feat? Yet the same people will spend a lifetime defending the same degree of probability concerning evolution.

Clark notes⁸⁶ anyone invoking such unusual chance undermines the very basis of science. Science is based on probable occurrences and once chance is admitted as a "mechanism," everything becomes indeterminate. A scientist could never rule out chance in any of his studies and scientific work would be impossible to perform.

The high odds against the formation of complex organic compounds such as DNA and proteins by chance have been discussed.⁸⁷⁻⁹² The chance that "nature" could organize anything is slight.⁹³⁻⁹⁸ Probability is just one of the many mathematical arguments against evolution. Evolutionists themselves have shown little faith in present evolutionary theories from a mathematical standpoint.¹⁰⁰

G. Origin of the Second Law

Barnes states¹⁰¹ that the Second Law came into operation after the universe was created completely. Morris suggests¹⁰² that the origin of the Second Law was connected with the Fall.

IV. Conclusions

Creationists have utilized thermodynamic reasoning effectively in their opposition to evolutionary speculation. It is one of the most fertile areas of creationist thought. Not all of the creationist ideas can be explored in such a brief review. Interested students should study the references and all past issues of the *Creation*

Research Society Quarterly for a better knowledge of the subject.

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CREATIONISM IN THE TWENTIETH CENTURY

WILLIAM J. TINKLE*

It may be of value for one who has lived to this point of time in the twentieth century to recount his own experiences and observations along with certain notable discoveries during his lifetime.

At the beginning of the twentieth century this author was a school boy. Evolution, in the United States, was a subject for university professors and theologians; very few others. It was very useful to "infidels" as atheists were then called, and there were vociferous ones. The doctrine, then 41 years old, counting from Darwin's *Origin of Species*, had not yet appealed to the common man.

School books did not discuss the origin of the earth, or the origin of living things. The authors did not mention divine creation or materialistic theories of beginnings, but ignored both of them, taking an agnostic position. The McGuffey readers which my father read were no longer adopted in Indiana, and the readers which replaced them were quite eclectic. They included stories taken directly from the Bible along with selections from literature and history. Geography and history books were mute about beginnings.

Yet as I now look back I am convinced that the net "evidence" for chance beginnings and

mechanical development was stronger then than now, because the difficulties had not yet been discovered.

Ideas Held Over

Coming now to the beliefs of scientists at the turn of the century, we note certain beliefs of the nineteenth century which still were in vogue. Among these were the inheritance of acquired characters, and recapitulation in embryos.

Characters of living things acquired through the environment, or use or disuse, are recognized now but they are not transmitted to the following generation.¹ This is now recognized even in Russia, where a few decades ago a group with political backing held out for the theory. As for embryos going through the stages of their supposed ancestors, the idea has been dropped by both creationists and evolutionists.² The demise of inheritance of acquired characters and recapitulation has made evolution much harder to believe.

Hero Worship

However, evolution, the doctrine that life arose by chance and became more complex by material forces, is not science but a type of natural philosophy. Science consists of facts but natural philosophy persists in spite of facts, if it satisfies the desires of people about the nature of the world.

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The man who faced the scholars and theologians and changed the world view of the majority, easing their responsibility to God, became, and is, a hero. In the nineteenth century, Charles Darwin was that hero. Even at the present time, Darwin's mistakes are forgotten and his feeble ideas of genetics are lauded.

Charles Darwin's ideas were dominant in the latter half of the nineteenth century. The result was that the influence of the real scientist, Gregor Mendel, was delayed until the twentieth century, 35 years after completion of the basic research.

When Mendel read his paper on inheritance in peas before the Natural Science Society of Brunn in 1865, it was recorded in the minutes of the meeting that there was no discussion. It was also recorded that later in the evening, Alexander Makowsky mentioned "with the utmost enthusiasm" a book written by an Englishman named Darwin six years previously and entitled, *The Origin of Species*.³ The scientists discussed that book for the balance of the evening; and, all of Europe did the same for the rest of the century. Since 1900 however, Mendel's influence has been tremendous.

It is true that Mendel's paper was published in an obscure journal and that he had but little time for research after he was elected administrator of the monastery where he lived. But the real hindrance was that scholars had accepted the assumption that life arose and developed by natural means, and they were looking for possible methods involved.

Genetics Versus Evolution

The first decade of the twentieth century was a time of great strides in genetics and cytology. A number of scientists saw clearly that their science pointed away from evolution, but most of them refrained from making an overt break with other scientists. Alfred Russel Wallace, Darwin's close friend and co-worker, said, "On the general relation of Mendelism to evolution, I have come to a very definite conclusion. That is, that it is really antagonistic to evolution."⁴ William Bateson (1861-1926) said at a meeting of the American Association for the Advancement of Science at Toronto:

It is impossible for scientists longer to agree with Darwin's theory of the origin of species. No explanation whatever, after forty years, no evidence, has been discovered to verify his genesis of species, . . . We no longer feel as we used to do, that the process of variation, now contemporaneously occurring, is the beginning of a work which needs merely the element of time for its completion; for *even time cannot complete that which has not yet begun*.⁵

Nevertheless, along with this frank statement Bateson gave reason to believe that he still had faith in evolution and hoped some method of its occurrence would be found.

A Great Decade

Actually, the above statement by that great and honest geneticist in December 21, 1921, along with others resembling it, gave a great impetus to the creationist movement in America. The decade, 1920-1930, was a time of marked and noisy protest by ordinary citizens against evolution.

It was somewhat like the present movement, yet with different spokesmen. The leaders were mostly Christian ministers who were not highly trained in theology. They did well in giving full credit to the Bible, but in criticizing evolution they down-graded science as well. A common slogan was, "It is better to know the Rock of Ages than the ages of the rocks." Present day creationist spokesmen, many of whom are scientists, give due credit to careful study by scientists, but emphasize a real cleavage between science and evolution, calling the latter a naturalistic philosophy.

While my memory may be faulty, I remember only two outstanding leaders of that decade: William Jennings Bryan and George McCready Price. The former was well educated, although not in science, was three times nominated for the Presidency by the Democrat Party, and served as Secretary of State under Woodrow Wilson. As an orator he seldom has been equaled.

G. M. Price was born in Canada, was well educated in languages and philosophy, and taught in several colleges. Through his long life he studied the history of science and reports of geologic exploration, wrote a number of books, and contributed much to the creation movement. Although accused of belonging to no scientific society, he was a member of the American Association for the Advancement of Science and the California Academy of Science. Price was criticized sharply, just as any one else is likely to be who finds fault with a "sacred cow."

The protest of the twenties was directed against those who taught evolution, and Tennessee legislators passed a law against such teaching in the public schools. Such action was taken also in Arkansas and Mississippi.

The trial which was held at Dayton, Tennessee in 1925 to test the law in that state has received much publicity and needs no report except to give some facts which otherwise might not have been mentioned. When W. J. Bryan decided to go to help the prosecution he asked Price to go with him, but the latter declined because of making a trip to Europe.⁶ Bryan had not tried a case in court for 20 years and was in

poor health, as evidenced by the fact that he died a few days after the trial.

I have sat in the drugstore where the teacher, John T. Scopes, was persuaded by George Rappleyea, a member of the Civil Liberties Union, to say that he had taught evolution, although he did not remember having done so.⁷ In my three visits to Dayton I have learned that residents of that typical small county seat still believe that God created man in his own image.

The three state laws mentioned above have been repealed. A more modern thrust is the ruling of the state of California Board of Education that where evolution is taught, creation also should be presented as an alternative theory. Citizens in other states, notably Texas, are seeking similar rulings.

Great Men Help Creationists

All through the twentieth century, evolutionists claimed that no educated scientist has believed in divine creation, but that charge is not true. Henri Fabre (1825-1915), a French entomologist, spoke very clearly against evolution. He was well educated but preferred to live simply, devoting himself to his research and writing. This very interesting writer stressed the importance of intelligent design in living things, and that an adaptation must be fully formed and able to function well the first time rather than accruing gradually.⁸

Another very able biologist was Wilhelm Johannsen of Denmark (1857-1927). While his actual beliefs are hard to find, his discoveries disclosed the limits of selection. Johannsen found that large beans when planted usually yield large beans, just as one would expect. But narrowing his research, planting separately large and small beans which had descended from the *same plant*, there was no difference in the size of the progeny.⁹ Selection, Darwin's proposed method of supposed evolutionary change, was not effective. Those results, obtained about 1909, have been repeated by other workers and in other species, with the same results.

Since I had been trained by my studies to believe that the greater the selection, the greater the improvement, these results were quite surprising to me. Johannsen showed that selection merely sorts the genes and becomes ineffective when the genes are all alike, even though there may be differences due to environments.

James D. Watson and F. H. C. Crick, in their work which showed the gene to be very complex, and that the trait to be transmitted depends upon a code, have made it hard to believe in evolution by chance.¹⁰ The code resembles a word, and its formation is by action of units of atoms, very much as a word is formed by a proper sequence of letters. It is noteworthy that codes

have never been formed without intelligence.

It is recognized that the proof or disproof of evolution comes from geneticists and geologists. Developments in geology have been disappointing to evolutionists in that gaps between the categories of fossils have not been filled. Just as in living things, no fossil plant or animal forms have been found to bridge the gaps between orders, classes, and phyla. Likewise, after much patient search, no undisputed fossils have been found beneath the Cambrian rocks. These negative results make it easier to turn to the Biblical account of a general creation in the beginning.

Creationists Organize

Seeing the discrepancy between the claims of evolutionists and established scientific facts, modern creationist scientists and non-scientists have banded together to publicize their views. At present there are many organizations, and only a few will be mentioned.

The Evolution Protest Movement of England founded in 1932 was the earliest organization and has had some good scientists as officers and members. A noted one was Douglas Dewar, an ornithologist who lived in India a long time. This organization has remained firm to the original purpose.

The American Scientific Affiliation was formed in 1941 by one man inviting five scientists to come together while he paid their expenses. These five became the first board of directors. Many creationists having scientific training became members. After a few years the statement of belief was liberalized in order to attract more members and the thrust against evolution was lessened. The subjects chosen for discussion thereafter were the present needs of society.

The Christian Evidence League of Malverne, New York arose in 1946 after the Religion and Science Association had dissolved because of member disagreement over the issue of a possible gap in the record between Genesis 1:1 and 1:2. The League publishes *The Creationist*, which includes a wider range of titles than creation and evolution.

After a number of years, support for creationism seemed to lag. About 1960 I wrote to Dr. Walter Lammerts, asking if we could not do something to increase the amount of work done. He answered, "Give me ten men who are active and we will do more than all others are doing at present."

My reply was that we could find those men; so we wrote to eight men and established the "Team of Ten." We published and helped each other, but Dr. Lammerts soon had a vision of a larger organization. In 1963, at a joint convention of the American Scientific Affiliation and the Evangelical Theological Society, at Wilmore, Ken-

tucky, a group of interested persons worked on the first draft of the Statement of Belief for a new organization, the Creation Research Society. The growth of the organization has been much greater than we expected, and we have never found it necessary to consider changing the Statement of Belief.

The Bible-Science Association with headquarters at Caldwell, Idaho was formed in 1963. This organization publishes a newsletter and sponsors sale of a wide variety of creationist literature. And the Bible-Science Association sponsored a four-day meeting of all creationist groups in the United States at Milwaukee, Wisconsin, October 10 to 13, 1972 which was well attended and set a mile post of progress.

In conclusion, let us consider how the characteristics of the present decade, 1963-1973, are unique. The century-old discussion of creation versus evolution centered in disagreement between scientists and religionists; but as a news writer has well stated, the present argument is between two groups of scientists. Although spokesmen at educational institutions were scarce in the 1920 decade, today there are hundreds of such leaders.

While present creationist organizations have endorsement from many theologians, the outstanding creationists today are scientists. Many of them are young men and women who have detected for themselves the mistakes in evolution, and see that divine creation is a more valid world view.

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THE CREATIONIST AND CONTINENTAL GLACIATION

WILLIAM A. SPRINGSTEAD*

This is a review of both catastrophic and uniformitarian writings about numerous facets of glaciology. While the author discusses literature covering many viewpoints, he concludes that the data have best fit with a monoglacial action of reduced scope following the flood of Genesis.

Introduction

The Biblically oriented creationist espouses catastrophism. Recognizing the present process rates in their relationship to part of earth's previous history, he is also convinced that there is evidence for global catastrophes in the past. As a Biblical literalist he holds that a devastating flood of global proportions made radical changes in earth's biotic life and crust. Similarly he holds that glaciation produced by catastrophic agencies also occurred, drastically changing parts of the earth.

Frequent criticisms of doctrinaire uniformitarianism have been published in recent years. Articles have appeared in scholarly journals and from the pens of competent scientists calling for new and modified definitions.¹ A new school of

geological thinking, termed neo-catastrophism, has risen. Its proponents recognize evidence for unprecedented process rates in the past.² It may be predicted that the adherents of this school will increase in numbers as scholarly research continues to uncover new evidences of catastrophism.

In appraising creationist views on continental glaciation numerous treatments will unfortunately be overlooked. Secular treatments of the subject alone are voluminous. Perhaps more articles have been written on Ice Age geology than on all the other geological ages combined. The reviewer trusts that creationists will therefore take a sympathetic position relative to the task undertaken. He further trusts that readers will make note of any articles overlooked and make them known by subsequent correspondence to the editor and this author.

A major difference between creationists and secular scientists lie in their interpretation of the

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extent, time, and duration of the ice age. Many creationists subscribe to only one major glaciation, rather than to the classic view of four glaciations. They associate the time of the continental glaciation as being either concurrent with or following the time of the global flood.

Creationists themselves differ as to the causes, extent and effect of the ice caps. Some hold to the theory that the ice was introduced by either an astral dump or the breaking up of an ice canopy encircling the earth. Still others hold to glaciation being produced by cold following collapse of a water canopy. Other creationists believe the causes may be found in the study of climatological and geological phenomena. Glacialists have advanced around 60 explanations for the appearance of ice caps. None of these explanations to date has received general acceptance. It is this reviewer's opinion that creationists should therefore be both cautious and non-dogmatic as to the cause. Neither Scripture nor scientific investigation has revealed the exact cause of this remarkable period.

Many creationists believe that continental glaciation followed the flood. Whitcomb and Morris, Harold Armstrong³ and this reviewer are among those who do. Donald Patten is an exception. He writes, "It is here proposed that the cause or causes of the Ice Epoch did not follow the Flood. They were one and the same catastrophe."⁴ Those who espouse the theory of an ice canopy encircling the earth, also believe that its breaking up occurred simultaneously with the Flood.

A. The History of Modern Glaciology

As a result of studying the movements of glaciers in the Alps, Swiss born Louis Agassiz wrote two books projecting a startling new concept to the then current geological thinking. The books were entitled, *Studies of Glaciers* and *The Glacial System*. In these works, appearing in the middle of the 19th century, Agassiz propounded the theory of continental ice caps in which he envisioned "great sheets of ice, resembling those now existing in Greenland, once covered all the countries in which stratified gravel (boulder drift) is found."⁵

Agassiz himself had formerly been a partisan of Lyell's theory of transport by icebergs and ice rafts. When Agassiz visited the British Isles in 1840, he along with William Buckland "extended the glacial doctrine to Scotland, Northern England and Ireland."⁶

The ice caps postulated by Agassiz were vast indeed. Writing of Europe he said, "We have to do with sheets of ice five to six thousand feet in thickness covering the whole continent."⁷ He wrote of the ice, that it "extended at least from the North Pole to the Mediterranean and Caspian Seas."⁸ Elsewhere he stated, "It extended beyond

the shore lines of the Mediterranean and of the Atlantic Ocean, and even covered completely North America and Asiatic Russia."⁹ Fifty years later Dawson was to appraise such a concept: "The glacier theory of Agassiz and others may be said to have grown till, like imaginary glaciers themselves, it overspread the earth."¹⁰

Multiple glaciation did not gain widespread acceptance until about the turn of the 20th century. Penck and Bruckner, after studying the forms and deposits of glaciation in the Bavarian Alps, wrote a three volume work entitled, *The Alps in the Ice Age*. In this work they popularized the concept of four phases of glaciation and labeled them Gunz, Mindel, Riss and Wurm. The work has become a classic among proponents of polyglaciology.

Monoglaciology was the generally held view of geologists for nearly a half century. One of its most able supporters was J. W. Dawson of Canada. Clark wrote the following eulogy of this great scientist, "He did more by precept and by spoken and printed word to further the progress of geology and education in Canada during that period than did any other person."¹¹ Flint was to note of Dawson's view rejecting polyglaciology, "The last scientific opposition to it in North America died in 1899 with J. W. Dawson."¹²

But scientific opposition to polyglaciology did not die with Dawson. The renowned, though controversial, American anthropologist, Ales Hrdlicka refused to accept geological indications for a succession of four glaciations in Europe. Alimen writes of French Paleontologists, "who admit only one glaciation in the Quaternary, viz, the Wurm."¹³ The late Richard Lougee contended, "Reduction of the ice age to 'unity' shortens geologic history and nullifies the meaning of the terms Nebraskan, Kansan, Illinoian, Wisconsin and the several interglacials." Lougee wrote, "Deposits formerly attributed to four or five separate Pleistocene glaciations are deposits of a single glaciation."¹⁴ Monoglaciology still persists today. Nor is the number of glaciations completely agreed upon by those espousing polyglaciology.

B. The Extent of Continental Glaciation

Evidence of continental ice caps in the northern hemispheres is generally accepted today. Cornwall has summarized: "Though there are still plenty of grounds for disagreement and controversy over questions of Pleistocene geology, the glacial origin of the Drifts in the middle latitudes is fully established today."¹⁵ There is however widespread variance of opinion as to the extent of the land glaciation. Agassiz may well have been prophetic for others when he wrote,

"I am certainly far from having said the last word about glaciers."¹⁶

It is widely held that nearly 30% of the earth's surface was formerly covered by ice, and that most of this ice was in North America. Woodbury states, "In Europe the extent of the ice was no more than one-third of its extent in Canada and the United States."¹⁷ Patten states, "The ice mass extended from Eastern Alaska to Central Europe, and from the fringes of Siberia to the central United States."¹⁸ A high school science text specifies, "In Europe the ice sheets covered most of Scandinavia, the British Isles, Denmark, Belgium, northern France, and the Baltic countries, and extended far into Germany and Russia."¹⁹

But creationists ought to be aware of qualifying statements. Ley has written, "In the Arctic, the last great ice sheets of the ice age never covered the North Pole at all but spread from centers hundreds of miles to the south."²⁰ Lindroth writes, "Alaska was little affected by the land ice, the major part of it remained ice free throughout the entire Pleistocene period (Flint, 1952) as did the opposite part of eastern Siberia."²¹ Farb includes western Canada along with most of Alaska and much of Siberia as having been ice free during the last part of the last glacial advance.²² Ewing and Donn postulate, "The facts about early man in the Americas support the idea of an ice free Arctic during Wisconsin time and hence during earlier glacial stages."²³

The extent of glaciation in Europe is also debated. West thus writes, "The evidence suggests the survival in southern Britain during the glaciations of open vegetation with a flora of many northern and montane plants."²⁴ Hibben states, "A land bridge between Great Britain and the European continent existed all through the Pleistocene period."²⁵

Turning to the European mainland, Alimen states, "France escaped the Pleistocene continental glaciation."²⁶ Flint specifies, "No part of Belgium was glaciated at any time."²⁷ Rankama wrote about "The continuous marine deposition in the western Netherlands."²⁸ Some glacial students have placed the southern edge of maximum glaciation in London and Leipzig. Can it be demonstrated that the glaciation in the Swiss Alps was any more extensive than one of a more localized nature? One thing is now quite certain, the ice caps never approached the extent postulated by Agassiz and others of his day. Creationists should be wary upon hasty acceptance of glaciation estimates.

C. The Catastrophic Nature of Continental Glaciation

Numerous creationists are convinced that glaciation occurred suddenly by catastrophic agen-

cies. Agassiz had argued for this in writing, "The ground of Europe, previously covered with tropical vegetation and inhabited by herds of great elephants, enormous hippopotami, and gigantic carnivora became suddenly buried under a vast expanse of ice covering plains, lakes, seas and plateaus alike."²⁹ Rejecting uniformitarian concepts, he said, "Therefore all the hypotheses of a gradual cooling of the earth, or of a slow variation either in the inclination, or in the position of the globe's axis are invalid."³⁰

Dawson held that the rapidity of ice melt following glaciation was responsible for widespread destruction of life. He wrote, "that Post-glacial flood, which must have swept away the greater part of men, and many species of great beasts, and left only a few survivors to repeople the world."³¹ Perhaps the extensive fossil remains on the continental land shelves argue for rapidity of flooding due to swift ice melt.

It may be noted that a few uniformitarians are themselves using the term catastrophic, or synonyms, for glaciation. Smith writes, "The arrival of a glacial period must therefore have been a cataclysmic event."³² Eiseley writes of the Ice epoch, "It was a world of elemental extravagance, assigned by authorities to scarcely one percent of earth's history and labeled 'geo catastrophic'."³³ Asimov notes, "There were catastrophes after all."³⁴

D. The Vast Extinction of the Northern Animals

The dramatic extinction of untold millions of animals in the frozen muck beds of Alaska and Siberia has puzzled and invited explanations from scientists beginning with Agassiz and continuing to those of the present. Hapgood writes of their great numbers, "Yet we know that along with the millions of mammoths, the northern Siberian plains supported vast numbers of rhinoceroses, antelope, horse, bison, and other herbaceous creatures, while a variety of carnivores, including the saber tooth cat, preyed upon them."³⁵ Resorting to a neo-catastrophist explanation Hapgood postulates the following cause of their great extinction,

In conclusion, it appears to me that the whole mass of the evidence relative to the animal and plant remains in the Siberian tundra, interpreted in the light of the evidence from North America, sufficiently confirms the conclusion that there was a southward displacement of Siberia coincident with the southward displacement of North America at the end of the last North American ice age."³⁶

Patten (a creationist) espouses a phenomenal astral ice dump as the cause of extinction. He states, "a great dump of astral ice, possibly 12,000,000 cubic miles, dumped over the mag-

netic poles, simultaneous in timing with the Flood, involving ice at temperatures approaching zero."³⁷ He then notes, "The mammoth carcasses were frozen rapidly, perhaps at temperatures below -150° F."³⁸

The chief problem with accepting Patten's, and similar views, is that the areas of the greatest extinctions in the north, were never glaciated. The remains are found in frozen muck or permafrost. Permafrost consists of deeply frozen soils and subsoils. Sanderson thus writes, "The really puzzling thing is that this permafrost in Alaska and Siberia contains enormous quantities of animal bones and flesh, half-decayed vegetation, wood, and other remains of living things that, in some areas, together constitute a sizable percentage of the whole."³⁹ Permafrost is quite different from either land or sea ice in composition.

Hapgood's suggestion of shifting poles poses difficulty. Such extinctions had to occur suddenly and dramatically. There had to be quick coverage along with sudden deep freezing. A pole shift occurring over several hundred years would hardly be sufficient.

Is there a possible solution to the puzzling situation? One is reminded of an excellent comment by Morris. He states, "In fact, there seems no way of accounting for most of the great fossil beds of the world, especially of vertebrate fossils, except in terms of very rapid burial and lithification, such as posited by the Biblical deluge, with its accompanying volcanic and tectonic activity and its inferred subsequent glaciological phenomena."⁴⁰ The greatest cause of extinction was the Genesis Flood. Genesis 7:21 thus records, "And all flesh died that moved upon the face of the earth, both of fowl, and of cattle, and of beast, and of every creeping thing that creepeth upon the earth, and every man."

But if all life was killed by drowning, how do we account for the deep freezing of the mammoths and other animals in Alaska and Siberia? Daly offers the following explanation, "As soon as the protecting vapor canopy fell, the heat radiated into space and the mammoths froze, 'suddenly . . . as of a single winter's night', as Dana expresses it, and knew no relenting afterward."⁴¹ Elsewhere he states, "That the collapse in temperature occurred, and the ice age began, exactly at the time of the flood when the canopy collapsed as proved by the frozen mammoths."⁴² Daly then postulates extinction by freezing concurrent with the Flood.

Patten's view is that there was an astral dump of ice by reason of another planet approaching close enough to earth to empty its load. He proposes that the "mammoth were encased suddenly in ice." He holds that their frozen condition "support the proposition that the Flood and the Ice Epoch were simultaneous global catas-

trophes (or rather, differing phases of the same catastrophe.)"⁴³

Is there any alternative to Daly's and Patten's view that the mammoths were killed by the causes they have postulated? In the first place it would be quite erroneous to think that the great beasts are usually found intact and in well preserved condition. Often the remains are torn asunder and intermingled with wood and vegetal debris. When the remains are exposed they are often in a half decayed condition. Further, half of the remains occur in Siberia, where the permafrost is "riddled with plant and animal remains aggregating untold millions of tons."⁴⁴

The coldest spot on earth today is in Siberia. Temperatures drop to 90° below zero. Summer temperatures in the same area may rise to 60° above. There then can result a temperature change of 150° from summer to winter. Besides this drop of temperature, there is the chill factor resulting from the wind. Author of a recent article on Alaska notes, "The sixty-mile-per-hour winds whipping across the slope's 76,000 square miles at just twenty-three degrees below would create a chill factor equal to 101° degrees below. In this environment unprotected flesh freezes in less than thirty seconds."⁴⁵ A chill factor of 150° below is not unlikely even today in either Alaska or Siberia.

Following the Flood, Genesis 8:1 informs us, "God made a wind to pass over the earth, and the waters asswaged." The nature and duration of this wind is said to have been a determinate factor in causing the flood waters to subside. Is it possible that this wind was also accompanied by a temperature drop in such places as Alaska and Siberia?

This reviewer would ask indulgence in suggesting the following cause of the vast frozen remains in these northern regions. The Flood itself was accompanied by overwhelming turbidity mud flows which both drowned and covered the mammoths and other life in the North. This was soon followed by an extreme drop in temperature and winds of great force. The winds caused the flood waters to subside and in turn deep froze the mud with its vast animal remains. The freezing was provided as a result of the chill factor produced by the winds. The effect was a vast area of permafrost which in some areas is around 1500 meters deep. The permafrost became the great graveyard for untold millions of drowned animals.

E. The Theory of Ice Rafted Debris

Sir Charles Lyell was among those earlier scientists who espoused ice-rafting, rather than glacial movement, to account for foreign rock debris in England and on the plains of Germany. Agassiz noted of Lyell's view, "He assumed that

the transportation of angular boulders had taken place on top ice rafts carried by water currents, in the same manner as the northern ice transports boulders, which are finally deposited along the northern shores of Europe."⁴⁶ Dawson was to comment later, "His views as to the combined agency of land ice or glaciers, of floating fragments of glaciers or icebergs, and of field ice are, or ought to be known; but I must say that they have been unfairly stated."⁴⁷

Agassiz had confessed unfamiliarity with the effects of floating ice, "Also I have not had as yet a chance to examine the influence on shore lines of great bodies of water with floating ice; however I doubt that their decision should be different than that of ordinary water."⁴⁸ But Flint, a modern glacial specialist writes, "Not all striations on rocks are of glacial origin; agencies other than glacier ice makes striations. A common glacial agent in high latitudes is floating ice in rivers, lakes and the sea."⁴⁹ Daly points out, "The ice age was an age of icebergs. The oceans had not yet receded off the continent."⁵⁰

There is accumulating evidence of broad misinterpretation of action by glacial movement. Ton-sized rocks were dropped in Missouri by means of floating icebergs. Lougee states, "Iceberg rafted erratic stones and boulders became grounded on the submerged topography of northern Kentucky, southwestern Missouri, and eastern Iowa."⁵¹ These ice raftings would undoubtedly result in striations such as was mentioned by Flint.

Gansser points out, from personal observations, "The author has seen many desert fanglomerates which, except for the absence of clearly striated boulders, could hardly be distinguished from glacier boulder beds, and certain mud flows can have striated pebbles unrelated to glaciation."⁵² Fairbridge has also pointed out, "Careful re-examination of the evidence in recent years, however, has rejected many of these ice ages; formations once identified as glacial moraines have been reinterpreted as beds laid down by mud flows, submarine landslides, and turbidity currents."⁵³

F. The Duration of the Ice Age

Students of ice age history are aware of widespread variance and disagreement over the duration of the glacial ice. Cornwall speaks for one group when he states, "The Pleistocene period is now reckoned to be some 2-3 million years long, including a longer earlier portion known as the Villafranchian."⁵⁴ Yet such a view is by no means uniform and has no general acceptance. Gilluly points out, "One of the most controversial items in geochronology is that of the duration of the Pleistocene epoch."⁵⁵

Haldane represents another quite prominent group when he states, "Indeed recent work sug-

gests that the Pleistocene period only lasted for about 300,000 years."⁵⁶ The reader should note that this estimate is a mere one-tenth of Cornwall's estimate. Springstead cites estimates held by a few geologists for a duration of only 10,000; 30,000; and 100-150 thousand years.⁵⁷

The chief method of dating the Ice Epoch has been in respect to postulated multiple glaciations and lengthy intervals. Krober has noted that the chief means of dating the Pleistocene is in terms of associated ice ages.⁵⁸ Springstead has pointed out, however, that the polyglacial view is faulty due to the lack of field evidence.⁵⁹

Only three mountain ranges in the United States provide evidence of more than one glaciation. Evidence of only one glaciation has been found in such mountain areas as the Apennines, Sierra Nevadas, Atlas Mountains, Anatolia, and the Balkans. One glacial stage only is known for Australia, Tasmania and for the Pontic and eastern parts of Turkey. Finally, polyglaciation cannot be demonstrated for many areas of glaciated land.

It must be kept in mind that all Swiss glaciers are "valley glaciers" and are in contrast to the extensive, more stable, continental glaciers found in Greenland and Antarctica. The Penck-Brucner formula for using Swiss glaciations to postulate glaciations elsewhere is fraught with error. Kurten has noted, "Many authors suggest that the Alpine nomenclature should not be used except in the Alps."⁶⁰

G. The Close of the Ice Age

A notable breakthrough was made in estimates of the duration of the Ice Age when it was discovered that its close was much more recent than had been previously estimated. Many authors suggest that its close has been within the last ten thousand years.

According to Bryan and Gruhn, "Some geologists argue that the Wisconsin ended when the last Laurentian ice melted about 6,000-5,000 years ago; this was based on the fact that the sea level apparently stopped rising abruptly about that time. (Frye and Willman 1960)"⁶¹ Hapgood, although a polyglacialist, writes of, "The last one, which ended only about 8,000 years ago."⁶² Watson and Sisson write, "The major eustatic rise of the ocean level, which ended about 5,500 years ago (Godwin and Willis, 1961, 1962) restored the North Sea to approximately its present stage. . . ."⁶³ Although such estimates can be no more than relative, they point out the recency of the ice melt in the Northern hemispheres. They are not far removed from some estimates for the Flood.

Through his study of the maps of the ancient sea kings, and through Dr. W. D. Urry's isotope core dates, Hapgood argues for a warm period in

Antarctica only a little more than 6,000 years ago.⁶⁴ Artifacts found by archaeologists on the frozen shores of the Arctic argue for the recency of the arctic ice. Both of these factors call for recency and rapidity of glaciation in those areas. In noting the rapidity of recent glacial demise in Alaska, Sanderson⁶⁵ significantly comments, "Perhaps forty days and forty nights of snow or rainfall could bring on an 'ice age' or a flood."⁶⁵

Conclusion

In conclusion, this reviewer would uphold the view taken by those creationists who are convinced continental glaciation followed the Genesis flood. In so doing, he would adhere to Dawson's conviction that the glaciations were smaller than those popularly conceived.⁶⁶

While such a view dramatically reduces the duration of the ice age, and also postulates its occurrence within historic time, the reviewer sees nothing incongruous in holding such a concept. Catastrophic occurrences may be reasonably demonstrated for several significant events. Only a catastrophe, covering one-fifth of the world's land area, can account for the enormous animal extinctions in Alaska and Siberia. The recency of their extinction is a matter of record. The rapidity of glaciation in the Arctic and in the Antarctic, within the last ten thousand years, also provides grounds for postulating catastrophic glacial processes elsewhere.

When the extensive field work to substantiate polyglaciology is carefully studied, the case for monoglaciology is strongly enhanced. And the duration of the ice age is seen to be much shorter. The Genesis Flood provided the water needed for consequent continental glaciation. The flood, not glaciation, was the chief agent of ice age extinctions.

Flooding had a much more prominent place, even during the ice age, than students of the subject have imagined. In fact, it would be much more appropriate to designate the over all time period as the Pluvial Age, instead of the Ice Age. Glaciations were much more localized than have been generally postulated.

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SHOULD MACROEVOLUTION BE TAUGHT AS FACT?

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The title question of this article is examined in light of evidence from morphology, classification, natural selection, mutation, biogeography, and anthropology. The author concludes that evolution theory is inadequate and certainly cannot be considered as a "fact." The author did not have the objective of thorough discussion of special creationism, but numerous "leads" to creationist literature are supplied during review of each topic.

A teaching professor in a college biology department has an awesome responsibility, for science is a "sacred cow" in our science-oriented civilization, and he influences the minds of numerous students. Many students may perhaps never seriously question the validity of what they are taught; most of them have preconceived ideas that have not been examined critically.

Students tend to accept the ideas they are taught if such ideas are said to be basic to a particular discipline. However, certain ideas can be said to explain reality; and yet, after further analysis and questioning, these ideas may be demonstrated to be contrary to reality. Therefore, the student faces the alternatives—acceptance or rejection, and as stated in an earlier paper:

Therefore when a student of the sciences is presented a controversial principle or [explanation of a] phenomenon or the interpretation of [data], he should expect the presentation to be as close to truth (reality) as is

humanly possible and that if there are two opposing views, both will be presented with the evidences for and against. If this is done, the student is then in a position to contemplate (one of the finest of all human endeavors) and attempt to draw his own conclusions. Unfortunately in many cases, the student is presented only one side of the picture and often the view is quite distorted.

If two interpretations of a principle are of such importance that both affect almost all other endeavors, the student should at least be presented both sides of the story. He may then be at such an angle to see beneath the reflections of the surface of the pool into the deeper more clear waters.¹

Let us consider the essence and implications of a controversial concept—evolution. It is a complex of ideas which is widely accepted and is said to be a basic principle of science; and, moreover, even an established fact upon which rests the very structure of science, especially the disciplines of the life sciences and historical geology. The importance and influence of this idea is concisely stated by Savage:

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The idea of evolution as the single most significant concept developed in the study of living organisms provides explanations for myriad biological processes and pervades every branch of biology from biochemistry and physiology to ecology and morphology. In addition, the concept has had profound impact upon thinking in every field of knowledge. Essentially, the principle of evolution implies *development of an entity in the course of time through a gradual sequence of changes from a simple to a more complex state*. The idea was originally applied to the historical development of life, and the word "evolution" was first applied to this process by the English philosopher Herbert Spencer. It is now recognized that organic evolution forms a very special part of a more general evolutionary process: The development of our universe, or cosmic evolution.²

Unless a student is adept at critical analysis, he cannot avoid the tendency to accept evolution as a valid explanation of reality since the concept is taught throughout the educational system.³ Even children's books and popular books on science present evolution as an accepted fact.

Nevertheless, there have been and are today many scientists who argue against the validity of evolution and are convinced that it is not a basic principle of science that explains origins and developments, but is a religious doctrine of faith.⁴ Many of these scientists have organized into societies which publish journals, e.g. The Evolution Protest Movement in Britain, and The Creation Research Society and the American Scientific Affiliation in the United States.

An increasing number of books and pamphlets are being published which propose to expose flaws in the concept of evolution.⁵ However, scientific debate over the "fact" of evolution is denied by the author of one of the newest textbooks on evolution. His statements express the one-sidedness of such texts:

The fact of evolution has not been controversial among biologists during the present century, at least no serious scholars have found need to question it in that time. Evolution as a real phenomenon is not a subject for debate, except occasionally among people who are either uninformed or for some reason anxious to impose dogma in the place of scientific learning. The study of evolution encompasses nearly all of biology, and the details of its processes, although extensively known, will draw the curiosity of investigators as long as scientific work is done.⁶

In contrast to the opinions of Eaton and other evolutionists, I shall attempt to demonstrate that evolution is **not** a fact and thus is not a real

phenomenon. Hereafter the word "evolution" will refer to organic evolution; any mention of nonorganic evolution will be clearly denoted by an appropriate modifier.

A Fallacy—Use of the Word "Fact" to Establish Evolution as Reality

By repeated quotation, it can be shown that many evolutionists have confidence in the acceptance of evolution as a fact. But, what is a fact? A fact is, by definition: (1) "that which is actual, as contrasted with that which is merely possible"; (2) "actual individual occurrence"; (3) "an indubitable truth of actuality"; and (4) "an actual event" (Runes, D. D. (Editor) *A Philosophy of Science*, 1960, Sixteenth Edition, revised. Philosophical Library, N. Y., p. 107). Furthermore, that which is actual exists or, in other words, actually is reality. Therefore, something is factual if there is evidence which the truth of its actuality may be established beyond reasonable question or doubt.

Scientists attempt to understand and reveal the essence of natural (material) phenomena. Fundamental to science is the making of careful observations and collection of data. This is accomplished by perception via the senses, with or without use of instruments that are extensions of the senses. The data provide information that can be systematized and expressed as relationships and interrelationships by which scientists attempt to gain insight into the complexity of phenomena.

It is, therefore, the objective of scientists to provide concepts that are expressions of actuality (facts). These concepts are derived from highly probable connections of the data and are finally expressed as hypotheses, theories, and laws. However, in order to be valid, such concepts must be subject to verification via tests that are repeatable.

Nonverifiable suppositions cannot be combined to produce a concept that is fact. Evolution is based upon several assumptions which when subjected to critical examination are found to provide evidence against the concept of evolution. Take the study of microorganisms as an example.

Morphology and "Relatedness"

An evolutionary interrelationship is presumed among viruses, bacteriophages, *Mycoplasma* (pleuropneumonia-like organisms), rickettsia, budding bacteria, actinomycetes, true bacteria, spirochetes, myxobacteria, blue-green algae, slime molds, protozoa, algae (green, red, and brown), fungi, metaphyta or embryophyta, and metazoa. The metaphyta and metazoa could each be divided into numerous subgroups, but for the present discussion, this is not necessary. The crux of this assumption is, as worded by Kerkut:

If one assumes that the origin of life was a unique occurrence then it follows that all the present-day living things must be derived from this original source. This then poses the problem, "What is the relationship between present-day forms?" In many cases it is difficult to form any definite conclusion regarding these relationships. . . .⁷

If one refers to textbooks, journals, and monographs that discuss the details of these groups of organisms, it is immediately evident that there is no common agreement among biologists as to the taxonomic relationships within many of these groups, much less among the groups as a whole. Each of these groups possesses what at least appears to be characteristic structure, chemistry, metabolic processes, movement, irritability, growth, reproduction, development, adaptation, and behavior.⁸ Furthermore, proposed schemes of relationship are problematical, vague hypotheses and speculations.

Though there are numerous answers, one of the fundamental questions is: Which of these major groups of organisms is (are) the most (more) primitive, i.e. earliest (earlier) developed?⁹ Answers to this question vary in accordance with the individual biologist's opinion as to what are "primitive" characteristics and what are "advanced" characteristics.¹⁰

All of these groups of organisms exist at the present time, and the groups with members that are extremely small and delicate could leave no (or in a few cases very poor) fossil record.¹¹ Thus, there is no verifiable connecting evolutionary "theme" among these organisms. Therefore, how can it be assumed that they are interrelated through divergent derivations from an original "life-source"? If evolution has occurred, gaps among these major groups of organisms should not occur.¹²

Classification

The fact that it is possible to arrange the various kinds of organisms into categories of species, genera, families, orders, etc., is supposed to suggest that there are genetic relationships between them.¹³

Biologists have long believed that sexually reproducing organisms occur in distinct clusters or kinds. This concept is one of the most basic in biology and involves the idea of "species." Numerous attempts have been made by biologists to develop a definition for the term "species." Most evolutionists employ the definition of Mayr which was proposed in 1940:

A species consists of a group of populations which replace each other geographically or ecologically and of which the neighboring ones intergrade or interbreed wherever they

are in contact or which are potentially capable of doing so (with one or more of the populations) in those cases where contact is prevented by geographical or ecological barriers.

Or shorter: Species are groups of actually or potentially interbreeding natural populations, which are reproductively isolated from other such groups.¹⁴

Mayr's definition seems simple and straightforward; but interbreeding in natural populations is often difficult or almost impossible to confirm.¹⁵ Furthermore, many groups of organisms exhibit considerable individual and/or population variations in appearance. Therefore, it is most difficult to determine whether certain organisms are members of a single species or several species that resemble one another in morphology.

As a result of this dilemma, biologists have often designated variants in or between populations to be a different species; but later it has been discovered that interbreeding occurred between variants. Thus, it should be clear that the "species problem" is still in an unsettled state. An interesting comment about this problem was made by Ehrlich and Holm:

The term *species* should be retained only in its original, less restrictive sense of "kind." There seems to be no reason why quantitative methods should not be used to study phenetic relationships (those based on similarity rather than imagined phylogeny) at what we now loosely call the species level.¹⁶

Ehrlich and Holm are evolutionists, but the statement quoted above is in agreement with the opinion of current special creationists, e.g., according to Morris:

. . . Nothing in the account [Genesis account of creation] indicates how many original "species" there were, or what constitutes a "species." However, it does clearly indicate that there were meant to be definite limits to the possible biological changes that might take place. The only biological unit identified therein is called a *kind*, and at least ten times in the first chapter of Genesis it is mentioned that the various types of living creatures were to bring forth "after their kind." This states, quite plainly, that there were to be definite limits to possible biological change, perhaps, by implication, these limits being those of interfertility. But within those limits, it can surely be inferred that variation and speciation are possible.¹⁷

The original Genesis kinds¹⁸ should constitute the true basic units of our system of classification rather than the "species" category. The scientific record shows that there have been and are today physiologically compatible, genetically variable

groups of organisms. There is no evidence that such groups were or are today genetically inter-related.

Attempts to show genetic relationships above the "species" level are arbitrary; for, according to Blackwelder:

The only standard to determine the correct level of a group is the agreement of specialists. The group may be quite definite and understood by all, but its level may be subject to much difference of opinion. It may appear in various classifications as a class, a subclass, an order, or even a phylum, according to the classifier.¹⁹

Natural Selection and Mutation

The fact that entirely new varieties appear in populations of organisms is offered as the best present-day visual proof of evolution; "these new characteristics are called 'mutations' and it is said that, if these turn out to be favorable, they will be preserved by natural selection and thus contribute to the long-term evolutionary process."²⁰

Mutation—Mayr²¹ defined mutation as "a discontinuous chromosomal change with a genetic effect." This is a broad definition in which Mayr included

... ordinary gene mutations, chromosome mutations (translocations, inversions, and so forth), and genome mutations (chromosome losses, polyploidy, and so forth). The majority, possibly the vast majority of mutations consist of gene mutations, but since there is no way of distinguishing phenotypically between gene mutations and other mutations, we must apply a broad definition.

All of these varieties of mutation have contributed to the process of evolution, e.g. according to Bonner:

[Mutation] is really the factor of fundamental importance. Since mutation means a chemical change in the gene structure, all progressive advancements must ultimately be by mutation, and all that can be done by recombination is to shuffle what is given by mutation. Gene mutation provides the raw material for evolution, and recombination sets this material out in different ways so that selection may be furthered by being provided with a whole series of possible arrangements.²²

However, most mutations are detrimental; and those that do not kill an individual may be detrimental to the population in that they lead to disorder and randomness through deteriorations of viability, hereditary diseases, and eventual genetic weaknesses.²³ This is an excellent biological illustration of the Second Law of Thermody-

namics in operation.²⁴ Crow briefly summarized how mutations are harmful:

... The degree of harm ranges from mutant genes that kill their carrier, to those that cause only minor impairment. Even if we didn't have a great deal of data on this point, we could still be quite sure on theoretical grounds that mutations would usually be detrimental. For a mutation is a random change of a highly organized, reasonably smoothly functioning living body. A random change in the highly integrated system of chemical processes which constitute life is almost certain to impair it.²⁵

Geneticists cannot explain how mutations can be the mechanism for evolution and furthermore, according to Mayr²⁶ the fact that some geneticists can come to conclusions diametrically opposed to those of other geneticists is striking evidence of our ignorance of the actual facts.

Natural Selection—This process is the differential perpetuation of genotypes in which those individuals with the most favorable genes will survive and will tend to leave more offsprings. This is an excellent example of narrow circular reasoning in that evolutionists speak of the survival of the fittest and conversely, the fittest survive.

Natural selection is supposed to be the mechanism by which certain mutations are favored and give rise to higher categories of organisms. However, notice the contradiction between the first and last sentences in the following quotation which is an illustration of the contradictions common in writings of evolutionists. Crow says,

The general picture of how evolution works is now clear. The basic raw material is the mutant gene. Among these mutants most will be deleterious, but a minority will be beneficial. These few will be retained by what Muller has called the sieve of natural selection. As the British statistician R. A. Fisher has said, natural selection is a "mechanism for generating an exceedingly high level of improbability." It is Maxwell's famous demon superimposed on the random process of mutation. Despite the clarity and simplicity of the general idea the details are difficult and obscure.²⁷

Genes may become partially or almost completely isolated within a population which for various reasons may lose genetic contact with a parent population, i.e. there may develop segregation of a small gene pool from a larger one. Therefore, the characteristics (which result from the expression of genes) may be quite different for various populations and certain characteristics may exhibit gradations within populations that have not been completely separated; i.e.,

there is still gene flow between them. This situation illustrates how variation may occur within the range of a species, but it is not evidence for the production of new, higher categories of organisms.

It is verifiable that the influence of certain environmental factors can favor the propagation of offspring of certain variants in a population while tending to prevent or hold to a minimum survival of the offspring of other variants. However, this process in no way demonstrates that variants can give rise to other kinds of organisms; i.e., higher categories. Indeed, the data from genetic and selection studies conducted under natural as well as laboratory conditions are contrary evidence to the conclusion given by Mayr:

In conclusion we may say that all the available evidence indicates that the origin of the higher categories is a process which is nothing but an extrapolation of speciation. All the processes and phenomena of macro-evolution and of the origin of the higher categories can be traced back to intraspecific variation, even though the first steps of such processes are usually very minute.²⁸

In summary, it may simply be said that natural selection explains how organisms survive, not how they give rise to higher categories.²⁹

Biogeography—As Morris has written, "The tendency of certain species of plants and animals to vary in character with geographic location, and especially to assume distinct characteristics when isolated from similar populations in other regions, is presumed to suggest evolution."³⁰

Biogeographic studies show that some species are quite variable in different geographic locations. In diverse localities environmental pressures vary; thus, there are different selection pressures for each population and this is reflected in the geographic variants of a species.

However, there may be isolated populations within proximity of one another and their environments may be very similar. Therefore, in this latter situation, variability may not result from different selection pressures, but may come about from genetic differences that result when segregation of populations occurs.

Although many species exhibit quite variant populations, there is, nevertheless, fixity within the species category. Isolated populations with distinct characteristics (resulting from different environmental selections pressures and/or genetic segregation) may properly be called subspecies but not "evolving species."

Many subspecies may appear to be diverse enough from one another that each could merit the rank of species. However, if one will recall that there are extremely diverse varieties or "breeds" within domesticated plant and animal

species, then the error in this reasoning will become evident.

It is often said that isolated subspecies that do not interbreed should be recognized as different species. However, the following example will show why this is not a correct interpretation of reality. The Great Dane and the Chihuahua are two breeds of dogs (*Canis familiaris*) that are mechanically unable to interbreed under normal circumstances because of size differences; and, furthermore, man maintains these breeds as "isolated populations."

However, if the various breeds of dogs were unknown and these two breeds occurred on separate oceanic islands and were discovered by the members of a scientific expedition, the biologists would in all probability consider the two breeds to be of different species and perhaps even of different genera. This example is, of course, hypothetical, but there are many real examples of this situation among the numerous so-called island species and genera that are supposed to have evolved as a result of isolation.

The Supposed Evolution of Man

Evolutionists say that man is an organism that differs only in degree from other primates, but not in kind, i.e. all of them arose from insectivore ancestors. Furthermore, it is postulated that man may have arisen from australopithecine-like ancestors whose fossils appear to show an interesting mixture of ape and human characteristics.³¹

Of the living primates, man is said to be most closely related to the African anthropoid apes (the chimpanzee in particular). This assumption was capitalized upon by Desmond Morris whose recent book, *The Naked Ape*, became a best seller.

If evolution is a fact, it must be established that man has "evolved" via the same processes that are assumed to have produced all other organisms. If, on the other hand, man differs in kind from all other organisms, how can this be explained by the concept of evolution? Perhaps this is the reason that no aspect of evolution has received such intense study and fervent debate as has the "evolution" of man.

Fossils that closely resemble modern man are often buried deeper than those which are supposed to be his ancestors.³² The "ancestral" fossils are usually fragments of skulls and lower jaws are relatively few in number as compared to those of other kinds of vertebrates. Anthropologists differ among themselves as to the significance of "key" primate fossils.

In other words, there is a poor fossil record of primates and especially of those upon which human evolution is supposed to be based. Therefore, where is the information from which artists depict complete pictorial reconstructions of man's

ancestors? Why are drawings, painting, and models of supposed human ancestors—"ape-men or men-apes"—so radically different when portrayed by various artists?³³ From this situation one may conclude that human evolution is nothing more than science fiction. We shall see.

Von Koenigswald, in *The Evolution of Man*³⁴ discussed the classification of the primates and the evolution of man. He concluded, "Though modern primates have similar body structures, their physical proportions vary a great deal. . . . Unfortunately, we know little about these proportions in fossil men and apes."

The book, *Man in Nature*,³⁵ by Bates includes discussion of "The Human Animal," "The Primates," and "Human Evolution." Bates shows clearly that man differs from all other primates in physical characteristics, behavioral characteristics, cultural characteristics, and capability and achievement.

Nevertheless, Bates defined man on the basis of fossils which are the only characteristics that were capable of preservation prior to written history. However, Bates' definition is related to fossil tools rather than to fossil bones: "Man's uniqueness is in the making of tools in accord with a predetermined plan or pattern."

Much Supposition, Vagueness Involved

A careful reading of *The Basis of Human Evolution* by Kraus³⁶ reveals the great amount of supposition upon which the concept of human evolution is based. The book is replete with details, but they are evidence of the uniqueness of man rather than of his evolutionary kinship with the animal kingdom which is the thesis of Kraus.

Fourteen fossil "landmarks" are assumed by Kraus to illustrate the morphological stages that have led to modern man. These stages begin with a Middle Jurassic stem mammal and terminate with Cro-Magnon Man.

However, Kraus did not explain why these fossils should all be included in an evolutionary sequence leading to man; i.e., he gave no justification for this arrangement of fossils except via a simple statement that they "will provide a reasonable picture until the gaps in our record are narrowed by new finds."

In contrast to Kraus, the book, *The Fossil Evidence for Human Evolution*, by W. E. LeGros Clark includes statements that acknowledge the vagueness of evidence for human evolution:

Undoubtedly the most intriguing question in the whole evolutionary story is, What was the ultimate origin of man? Or, put in zoological phraseology, at what stage in geological time did the Hominidae become finally segregated from other groups of the Primates, and what was the nature of the ancestral stock from which this segregation occurred? Un-

fortunately, any answers which can at present be given to these questions are based on indirect evidence and thus are largely conjectural, for the paleontological record of the Hominidae is still incomplete.

The interpretation of the paleontological evidence of hominid evolution which has been offered in the preceding chapters is a provisional interpretation. Because of the incompleteness of the evidence, it could hardly be otherwise.³⁷

Many anthropologists accept the more recent stages in human evolution as are outlined by Braidwood³⁸ in his book, *Prehistoric Man*:

At this moment, the evidence bearing on human evolution appears to subdivide into three stages:

1. An australopithecine-habiline stage, back over a million years ago, with several varieties of forms and with crude stone tools associated with at least some of them. Whether the australopithecines were on the direct line or not is not yet a matter of complete agreement.

2. An early human (*Homo erectus*) stage, beginning at least with the Java, Olduvai "Chellean," and Peking men perhaps a half million years ago and lasting down through the Heidelberg, Ternafine, and Vértesszöllös finds. This stage lasted to about 100,000 years ago.

3. Therefore came first, the *praesapiens* types such as Swanscombe, Steinheim, and Frontéchevade; then the Neanderthals and their less extreme contemporaries. Beginning about 40,000 years ago came the first traces of fully modern skeletons in Europe, which seems to have been anticipated in southwestern Asia by the premodern types such as Skhul. The present tendency is to lump all this stage under the term *Homo sapiens*.

There seems to be an increasing likelihood that the beings of the first stage will be accepted as "men." There is no question that we are dealing with tool-making humans in the second and third stages.

You will note a quickening of pace as the stages develop. Men were learning even better ways to adjust to the variety and to the changes in their environment. The fossil bones of their bodies show these adjustments, but the pace of the change is also amply demonstrated by the tools they made.

These concepts and others have been admirably summarized from the creationist views by anthropologist R. Daniel Shaw.³⁹

Braidwood's summary of the stages in human evolution is not in agreement with the opinions of a leading anthropologist and discoverer of

many of the aforementioned fossils, namely, L. S. B. Leakey.⁴⁰

... It seems to me more likely that *Homo habilis* and *Homo erectus*, as well as some of the australopithecines, were all evolving along their own distinct lines by Lower Pleistocene times.

I submit that morphologically it is almost impossible to regard *H. habilis* as representing 'a stage between *Australopithecus africanus* and *Homo erectus*'.

... I have never been able to accept the view that *Australopithecus* represented a direct ancestral stage leading to *H. erectus*, and I disagree even more strongly with the present suggestion of placing *H. habilis* between them. ... It is possible that *H. habilis* may prove to be the direct ancestor of *H. sapiens*, but this can be no more than a theory at present. ...

All that need be said at present is that there was a time at Olduvai when *H. habilis*, *Australopithecus* (*Zinjanthropus*) *boisei* and what seems to be a primitive ancestor of *H. erectus* were broadly contemporary and developing along distinct and separate lines.

A concise, objective summary of scientific knowledge of the history of man based upon fossil evidence and dating methods is as follows:

There is now and has long been a great variety of human and anthropoid forms on the earth. Brutal types of man are very ancient, but contemporary types were coeval with them. There is thus no evidence here for the evolution of modern civilized man.

Man is as ancient in the world as Mid-Pleistocene. From his beginnings he has always varied greatly in skull size and type, but has been alike in torso and legs. He has as large a brain at first as now—often larger. He was anciently contemporaneous with different anthropoids than at present. These latter were always similar to and yet very unlike man, as now. Man always was composed of various physically different races or varieties. These probably hybridized at any points of contact. He was spread over the greater part of three continents, Europe, Asia and Africa—and perhaps another three.

After thousands of years of existence in which his populations were scattered and scanty, often living under very arduous glacial conditions, he may have been replaced rather completely and suddenly by a modern type culture which started village life in the near East. This transition occurred about 9,000 years ago and quickly developed into the historic civilization of that area and of all the lands we know since. With this episode "modern life" began.⁴¹

Human Behavior Is Plainly Different

The behavior of man is plainly much different than that of other organisms, e.g., according to Adler's book, *The Difference of Man and The Difference it Makes*:

In the sphere of what is plainly overt and observable behavior:

1. Only man employs a propositional language, only man uses verbal symbols, only man makes sentences; i.e., only man is a discursive animal.

2. Only man makes tools, builds fires, erects shelters, fabricates clothing; i.e., only man is a technological animal.

3. Only man enacts laws or sets up his own rules of behavior and thereby constitutes his social life, organizing his association with his fellows in a variety of different ways; i.e., only man is a political, not just a gregarious, animal.

4. Only man has developed, in the course of generations, a cumulative cultural tradition, the transmission of which constitutes human history; i.e., only man is a historical animal.

In the sphere of interpreted behavior, involving an admixture of inference with observation:

5. Only man engages in magical and ritualistic practices; i.e., only man is a religious animal.

6. Only man has a moral conscience, a sense of right and wrong, and of values; i.e., only man is an ethical animal.

7. Only man decorates or adorns himself or his artifacts, and makes pictures or statues for the non-utilitarian purpose of enjoyment; i.e., only man is an aesthetic animal.⁴²

In his introduction to the above list of behavioral characteristics of man (p. 90), Adler acknowledged that there was some minor dissent: "With the one exception of language (sentence-making behavior), there are minority dissents on all these indications of man's uniqueness in kind—dissents that treat these indications as signifying only superiority or uniqueness in degree." However, Adler summarized the views of leading scientists today, such as Julian Huxley, Dobzhansky, Mayr, Simpson, Leakey, Rensch, Eiseley, von Koenigswald, Oakley, Washburn, and Le Gros Clark who, either as paleontologists or as evolutionists in general, deal with the problem of man's origin and difference, as follows:

In one set of terms or another, they all assert the *uniqueness* of man as an animal, by which they mean: first, that man possesses certain characteristics (forms of behavior springing from certain powers or abilities on his part) that are not possessed to any degree by non-human animals; and hence, second,

that man really differs in kind from non-human animals, not just in degree. In addition, there are several unique human traits that are not behavioral: man's erect or bipedal posture, his flexible hand with thumb opposed to forefinger, and the dominance of his cerebral cortex by either the left or the right hemisphere.⁴³

Furthermore, according to Adler's review of paleontological literature, there is inadequate evidence to conclude that man differs from other animals only in degree; i.e., there have been "tenuous interpretations and inferences" derived from inadequate data. In speaking of the inadequacy of the fossil evidence, Adler said,

Its inadequacy is absolute and irremediable for the simple reason that no amount of fossil data, no matter how carefully and soundly interpreted, can establish the existence of a critical threshold in the continuum of degrees of brain size and complexity. Without that being shown, it is impossible to tell whether a difference in kind that certainly looks like a real difference in kind, and is thought to be so by the paleoanthropologists, is superficial rather than radical. (p. 97)

Adler concluded (pp. 247-249) that the available evidence now supports the answer that man differs in kind from other animals. However, he qualified his conclusion by stating that the final answer will depend upon whether or not a future machine will be able to pass the conversational test. If it cannot, then the materialist hypothesis would be demonstrated to be false and conversely, the immaterialist hypothesis would be confirmed. The creationist, John Howitt, has emphasized the unique biological and spiritual traits which set man apart clearly from all other creatures.⁴⁴

Conclusion

As a teaching scientist, I have attempted to explain why evolution cannot account for the origin of life or development of complex, unique kinds of organisms from more simple, ancestral forms. I have argued that evolution is not a fact, and that as a concept it is not in the domain of science.⁴⁵ The concept of evolution is an emerging religion with many religious characteristics such as dogma, faith, doctrine, mysteries, life-orientation, etc.

Evolution and the Genesis account of creation cannot both be correct.⁴⁶ Regardless of what some persons claim, one cannot be a Christian Evolutionist without persistent mental conflict. Therefore, if evolution is invalid, what can be put in its place that will explain reality?

Can a Christian (scientist or layman) accept special creation as revealed in Genesis in the

light of modern science? The answer is a definite *yes*, but an adequate discussion of the subject would require another paper of at least the same length as the present one.

It has not been my objective to discuss special creation except in the manner of supplying key references to the creationistic literature. However, Marsh expressed clearly the philosophy of men that are believers in special creation:

The doctrine of special creation is not merely a creed to be accepted by faith. It appeals to the spiritual faculties, and also to the logical. Every fact of natural science is explainable logically from the viewpoint of special creation. In actual practice less faith is necessary in its application to nature than in the acceptance of the theory of organic evolution.

... in building his philosophy the special creationist begins with the few basic facts regarding biological beginnings and continuance which are found in the Bible. However, because of the paucity of information from this source he is largely dependent upon facts in the natural world for the superstructure of his philosophy. When the interpretation of material from the natural world is truthful and when the phenomenon is mentioned in the Bible, he finds harmony between it and the Bible record.⁴⁷

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A UNIQUE CREATIONIST EXHIBIT

GEORGE MULFINGER*

On April 13, 14, and 15, 1972, Bob Jones University presented an unusual creationist exhibit at Textile Hall, Greenville, South Carolina, as a contribution to a large regional science congress. Because of the eclectic nature of the major event, the total number of people viewing the exhibit was considerable—possibly in excess of 100,000. The Bob Jones University exhibit centered around paleontological findings that can be used to refute evolution, and that are not explained by conventional theories of the day.

Portions of the exhibit were based on work conducted by members of the Creation Research Society. Figure 1 concerns Dr. Clifford Burdick's palynology research in the Grand Canyon. Dr. Burdick kindly furnished color slides of pollen isolated from shale layers of the canyon, enlargements of which are shown at the four corners of the panel. Also a sample of Hakatai shale ("Precambrian"), the lowest level in which pollen was found, is displayed beneath the stratigraphic cross-section.

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The colorful panoramic view of the canyon was painted by Darell Koons, well-known artist and a professor of art at BJU. The four X's roughly mark the position of the shale layers in which the pollen was found. According to evolutionary theory, such pollen (that of higher plants such as conifers) should occur only at the uppermost of the four levels.

The occurrence of pollen at the lower levels, where it does not "belong," can be used to support the contention that as soon as plants existed, higher plants were present. Also it should be noted that there was no apparent "evolution" of the morphology of the pollen from the lower strata to the higher, even though hundreds of millions of years of development are supposed to have taken place from the "Precambrian" to the "Permian." (See *Creation Research Society Quarterly*, June 1966, pp. 38-50 and June 1972, pp. 25-30.)

Figure 2 concerns a small artifact found in Idaho. A baked clay figurine measuring 1½" in length, and broken as shown in the photograph, was unearthed by M. A. Kurtz in 1889 while drilling for water in Nampa, Idaho. Amazingly,



Figure 1. Research on fossil pollen in the Grand Canyon by Dr. Clifford Burdick refutes the theory of the evolution of higher plants from lower. See text for details. (This photograph and all others in this article were supplied by UNUSUAL FILMS of Bob Jones University.)

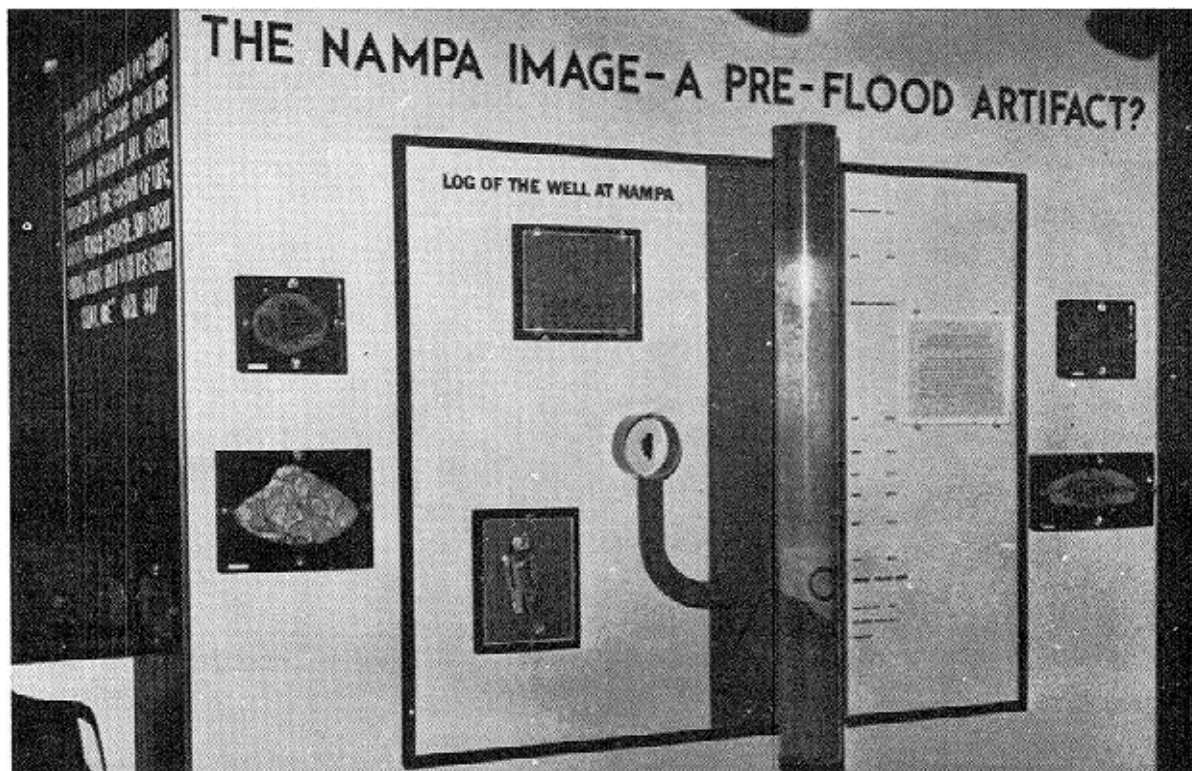


Figure 2. A small baked clay figurine brought up from 300 feet beneath the earth's surface may well be a pre-Flood artifact. The level at which it was found is said to be too "early" for man to be on the scene. See text for details.

it came from a depth of 300 feet, a level labelled "early Pliocene" by geologists who have studied the area.

Conventional evolutionary theory would place the object at a time when "large carnivorous animals were dominant," and "man as we know him had not yet arrived on the scene." Based on present stratigraphic reckoning the object would be somewhat more than 10 million years old! A more logical explanation would seem to be that the artifact was buried far more recently in a great catastrophic episode such as the worldwide Flood described in Genesis.

The "log" of the well, shown in the display, is based on official reports of Waldemar Lindgren, United States Geological Survey. The object was unearthed after drilling, in course, through 60 feet of soil, 15 feet of lava, 100 feet of sand and boulders, 1/2 foot of clay, 40 feet of sand, 1/2 foot of clay, 30 feet of sand, 15 feet of clay, and an additional 40 feet of sand.

No other artifacts or fossils were found in the entire operation. A factor speaking strongly for the authenticity of the find is its coloration, which matched that of clay balls brought up from adjacent levels.

The Nampa Image is located now in the Davis Museum in Boise, Idaho. We wish to express

our thanks to the Idaho State Historical Society for furnishing a substantial amount of information concerning this find, as well as several photographs. Though actual loan of the object could not be arranged, a remarkably accurate replica was produced by Carl Blair, prominent artist and member of the Bob Jones University art faculty.

Although virtually forgotten at the present time, the Nampa Image was reported in such journals as the *American Geologist* (Vol. 23, No. 4, pp. 267-272, 1899) and the *Proceedings of the Boston Society of Natural History* (Vol. 24, parts 3 and 4, pp. 424-450, 1890).

Figure 3 concerns objects found in coal that do not fit into any kind of evolutionary framework. On the far left is a sample of petrified wood with bark that has been changed to coal. This specimen was obtained from the Dorchester Horizon of the Buchanan Coal Field in Virginia. Such tree trunks give every evidence of having been washed into place chaotically by rapidly moving water.

Second from the left, although it does not show in the photograph, is a model of the gold chain found by Mrs. S. W. Culp of Morrisonville, Illinois in a lump of coal. The Morrisonville, Illinois *Times* of June 11, 1891, stated that Mrs.

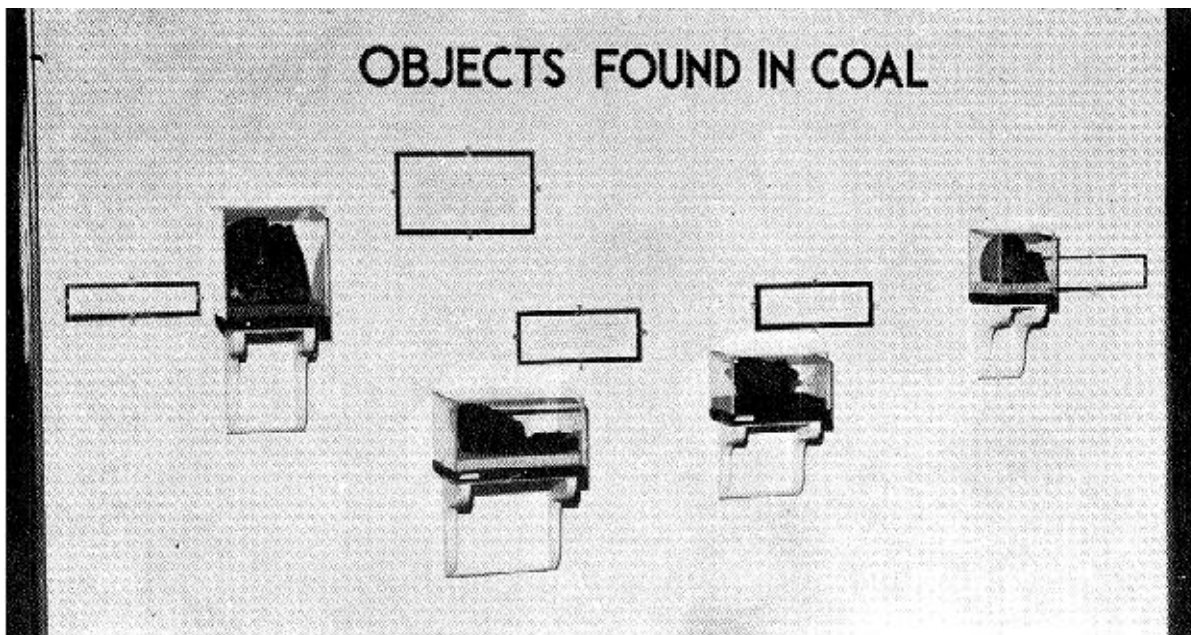


Figure 3. Many items found in coal cannot be explained by the conventional "peat-bog theory." Items displayed here are petrified wood, a gold chain (not showing in the photograph), an iron pot, and cobbles. See text for details.

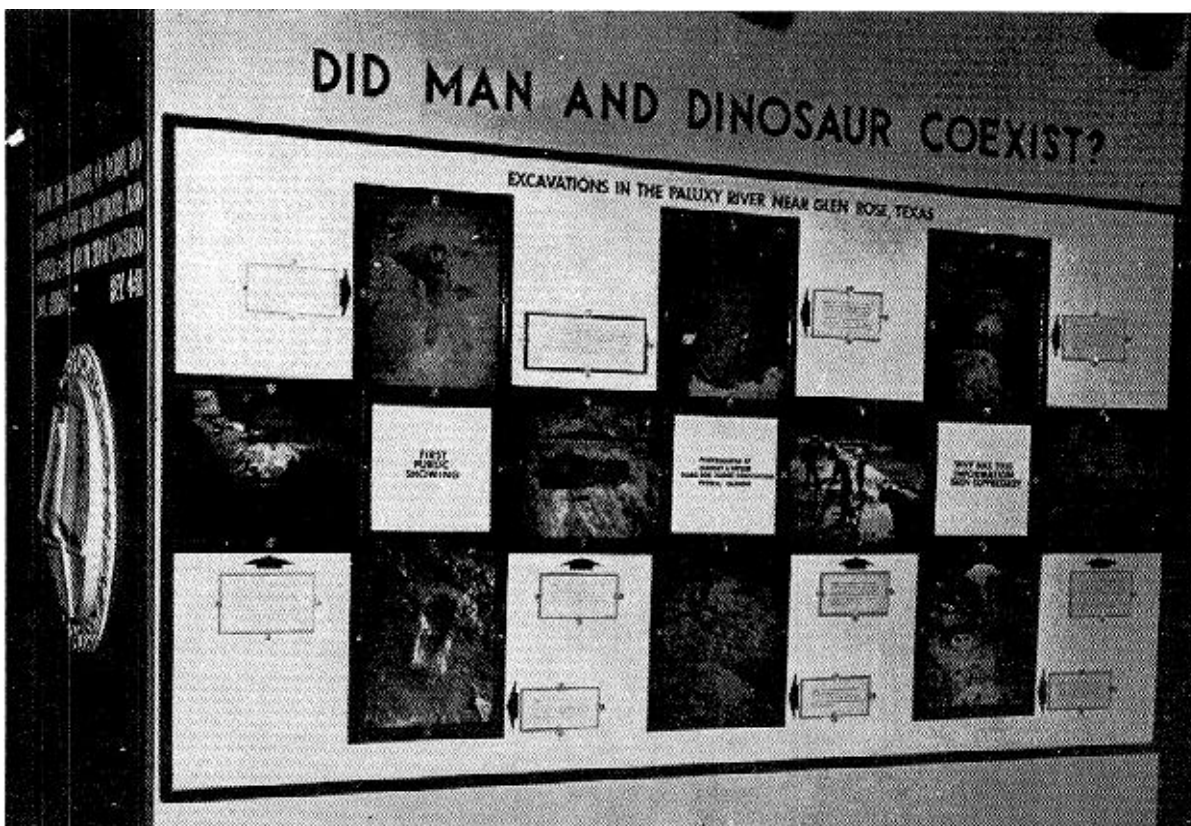


Figure 4. Excavations in the Paluxy River near Glen Rose, Texas. Photographs furnished by Mr. Stanley E. Taylor, Films for Christ Association, Peoria, Illinois. The evidence does not fit the idea of a 60-to-70-million-year gap between dinosaurs and man.

Culp broke a large piece of coal while transferring it to her stove. To her amazement she discovered a neatly coiled gold chain embedded in the middle of the chunk. Approximately 10 inches long, the chain was later assayed as 8-carat gold. As the piece of coal broke in two, the ends of the chain remained attached, one to each fragment. There is therefore no possibility that it had recently been dropped into the coal.

Third from the left in Figure 3 is a model of the iron pot found in coal and reported by Wilbert Rusch, Sr., in his paper entitled, "Human Footprints in Rocks," *Creation Research Society Quarterly*, March 1971, pp. 201, 202. Professor Rusch stated that the object had been traced to the Wilburton mines of Wilburton, Oklahoma, but that the alleged geological age of the coal had not been ascertained.

By writing to the Oklahoma Geological Survey we learned that the coal in question is considered to be "middle Pennsylvanian." The iron pot would therefore presumably be a 300-million-year-old antique. We would prefer to view it as a pre-Flood artifact.

At the far right of Figure 3 are cobbles found embedded in coal of the Dorchester Horizon, Buchanan Coal Field, Virginia. These cannot be satisfactorily explained by the conventional "peat bog theory" of coal formation. Erratics of this size could only have been washed in by powerful currents.

Figure 4 shows what proved to be the most popular part of the entire exhibit—ten beautiful color photographs of Paluxy River excavations

kindly furnished by Stanley E. Taylor, Films for Christ Association, Peoria, Illinois. These were on public display in this manner for the first time. Dinosaur and human footprints clearly show in the same "Cretaceous" limestone, in spite of the fact that there is supposed to be a span of 60 to 70 million years between the extinction of the dinosaur and the advent of man.

Figure 5 shows a diminutive fossil antelope (*Breameryx minor*) which was obtained as a loan from the Los Angeles County Museum of Natural History. According to museum officials, there is only one other specimen like it in existence. Both were obtained from the La Brea Tar Pits of Los Angeles. The caption on the display pointed out that scientists admittedly have no viable theory as to how the tar of the tar pits was formed, much less how so many different animals came to be preserved in it. Some kind of catastrophe would appear to be necessary to explain the observed facts.

Figure 6 concerning polystrate fossils shows a realistic three-dimensional model by the Bob Jones University art department and three photographs from N. A. Rupke's paper in the 1966 *Creation Research Society Quarterly* (Annual Issue). The captions explain that the sedimentary strata shown must have been laid down rapidly to preserve the tree trunks before they decayed. The theory of slow deposition seems quite inadequate to explain such findings.

Figure 7 (left-hand portion) shows an imaginary "mouse-to-bat" evolution presented by Byron Nelson in his book, *After Its Kind* (p. 96).



Figure 5. Actual antelope fossil from the La Brea Tar Pits on loan from the Los Angeles County Museum of Natural History. Scientists have no viable explanation for how the tar formed, much less how so many animals came to be trapped in it.

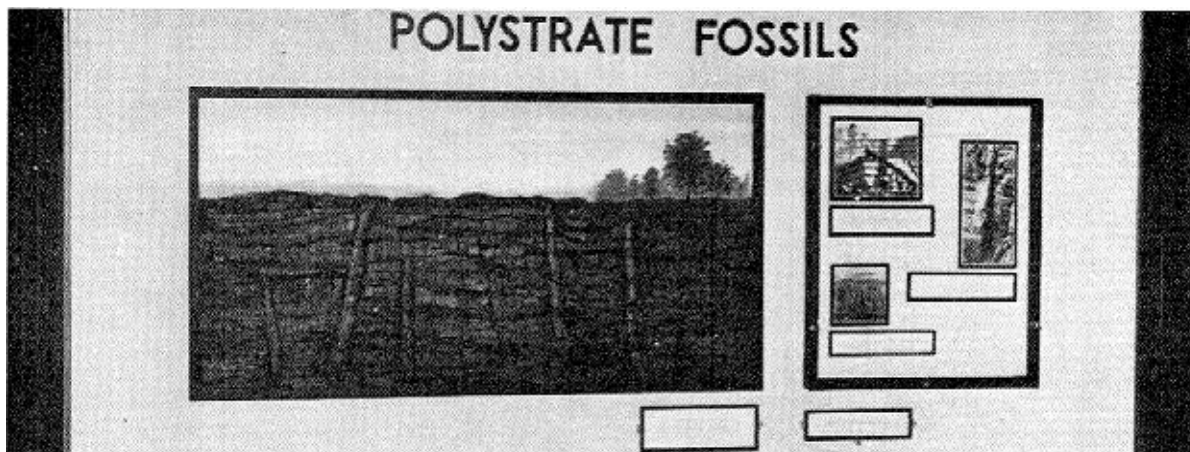


Figure 6. Polystrate (many-layer) fossils such as tree trunks are contradictory to the theory of slow deposition of sedimentary strata. The realistic three-dimensional model at left was produced by the Bob Jones University Division of Art. Photos at right are from N. A. Rupke's paper in the 1966 *Creation Research Society Quarterly* (Annual Issue).

This very effective illustration was prepared by Carl Blair.

Evolutionary theorists hold that the bat evolved from some ground dwelling creature such as the mouse. If this were true, we should expect to find a gradual merging from one type to another in the fossil record. It is remarkable that no fossils of the ten alleged intermediate forms have ever been found. Only the two kinds shown encased in plastic (mouse and bat) are actually observed in the fossil record. The "oldest" recognized bat fossil ("Eocene") already has the wings fully formed.

The right-hand portion of Figure 7 concerns the sandal or shoeprint found in Cambrian shale by William Meister of Salt Lake City. (See *Creation Research Society Quarterly*, December 1968, pp. 97-102.) Findings such as this can be used to point up the fictitious nature of the geological time scale. Though Mr. Meister had graciously agreed to loan the actual item for the three days of the exhibit, transportation details could not be worked out, unfortunately.

Figure 8 concerns what might be termed "age inflation." The chart at the far left, very masterfully lettered by Mrs. Robert Bell of Bob Jones University art department, shows how some commonly accepted, "inflated" age estimates have been greatly reduced as a result of radiocarbon dating.

Immediately to the right of the chart are specimens of fossil wood (white pine and redwood) furnished by the Iron Ore Company of Canada. Found in what was originally claimed to be "pre-Cambrian" rock, the wood was dated at only 4000 years of age by radiocarbon. Estimates of the age of the wood still range as high as 100 million years, and labels such as "late Cretaceous" are applied to it in spite of its high carbon-

14 content. (See Melvin Cook, *Prehistory and Earth Models*, pp. 332, 333.)

Next on the panel is a stalactite under study at Bob Jones University as part of a project funded by the Creation Research Society. Originally obtained from a cave in Mexico, the stalactite has been increased in size and weight by continually dripping a solution of calcium bicarbonate over it. The rate of growth is far in excess of conventional evolutionary estimates. (Full report to follow in a future issue.)

At far right is a color enlargement of the stalagmite at Carlsbad Caverns with an enclosed bat fossil that was depicted on the cover of the September 1971 *Creation Research Society Quarterly*. The point of this unusual find is that the rate of formation of the stalagmite must have been fairly rapid in order to encase the bat before the body of the animal completely decayed. Carcasses of the bat's contemporaries have long since disappeared from the scene.

Figure 9 shows a general view of the exhibit area. Location was excellent—close to the main entrance and approximately in the center of the building. Students and faculty members were on duty at all times to explain exhibits and answer questions.

An undertaking such as this is no easy task. Countless man-hours were expended by the art faculty, science faculty, and shop personnel. In addition to individuals already mentioned we would like to express our appreciation to Emery Bopp, Chairman of the Division of Art, and Paul Whitfield, Supervisor of Construction, who together masterminded the overall layout and execution of the exhibit. Lettering on the panels was done by Dave Appleman of the art faculty. Also, through the efforts of Dr. Joseph Henson, Chairman of the Division of Pure and Applied

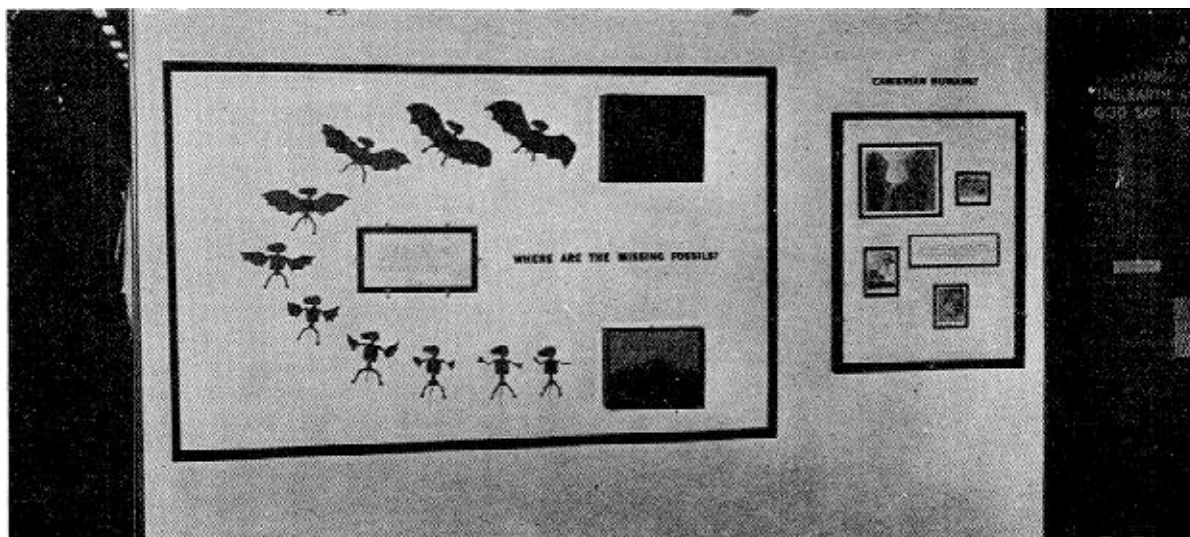


Figure 7. Display at left emphasizes the lack of intermediate species in the fossil record. The ten imagined in-between forms in the alleged rodent-to-bat evolution have never been found. At right is William Meister's human footprint in Cambrian shale. (See December 1968 Creation Research Society Quarterly.

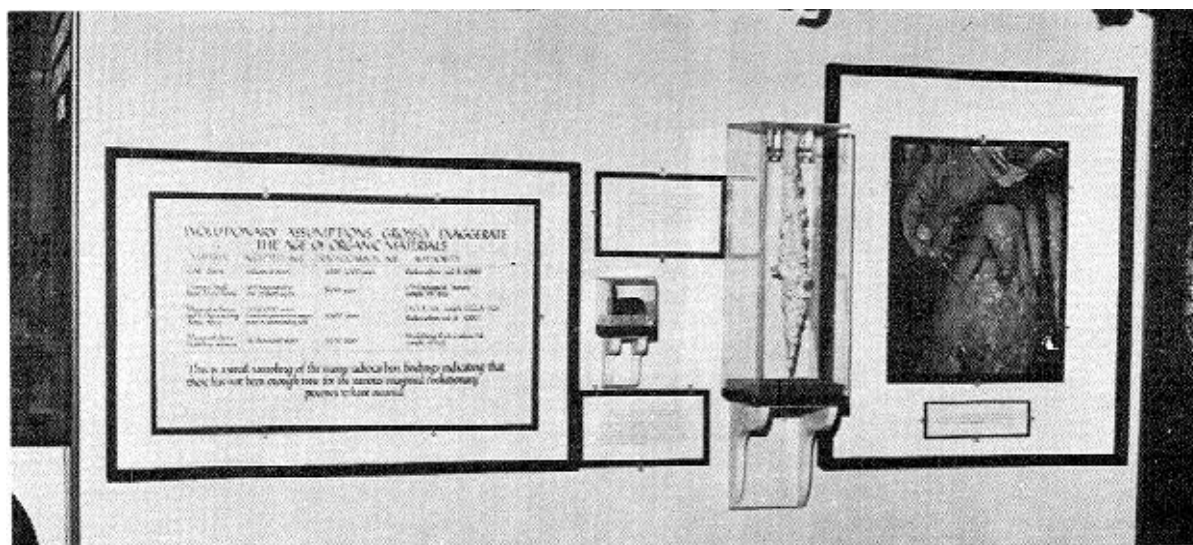


Figure 8. Some evidence of "age inflation" perpetrated by evolutionists. Radiocarbon findings show many former estimates of age to be greatly exaggerated. Stalactite at right is part of dripstone research being conducted at Bob Jones University. See text for further details.



Figure 9. General view of exhibit area showing Prof. George Mulfinger at far left. At right of information desk is Dr. Joseph Henson, Chairman of the Division of Pure and Applied Science at Bob Jones University.

Science, the very beautiful specimens of petrified wood and encased cobbles from the Buchanan Coal Field in Virginia were obtained for the exhibit. Finally, Dr. Guenter Salter, Dean of the College of Arts and Sciences, should receive special mention for the outstanding job he did in

coordinating the various departments that participated.

Most of the exhibits depicted here are being placed on permanent display in the Howell Memorial Science Building on the Bob Jones University campus.

ANNOUNCING: INVESTIGATIONS INTO BIOLOGY

Student's Manual: Companion to the textbook *BIOLOGY: A Search for Order in Complexity* (1970, Zondervan Publishing House, Grand Rapids, MI), *Investigations into Biology* contains carefully prepared lab exercises for every unit of the textbook, which require only minimal guidance from the instructor. It is illustrated. Questions for discussion at the end of each exercise require serious and logical thought and a clear understanding of pertinent material.

Teacher's Manual: The Teacher's edition of *Investigations into Biology* give the same materials as the student's edition, but with additional helps, prior preparation that will be required of the instructor, lists of materials and supplies, and answers to all discussion questions in the student's manual.

These two editions of this manual for the laboratory are available in convenient 8½" x 11" size punched to fit 2- or 3-ring notebooks.

Also available is a *Teacher's Guide* to accompany the above BIOLOGY textbook. Three helpful sections are provided: (1) Practical thought and action projects to enliven student curiosity, (2) carefully prepared answers to questions found in the textbook at the end of chapters, and (3) diagnostic and analytical questions intended to develop within the student correct reasoning in reaching his own conclusions.

All three books are priced at \$1.95 each from Zondervan Publishing House, Grand Rapids, MI 49506.

COMMENTS ON SCIENTIFIC NEWS AND VIEWS

HAROLD ARMSTRONG*

How Did Dust Baths Originate?

Everyone knows that birds bathe in the dust; apparently no one really is sure why. But P. L. Borchelt, at Michigan State University, has, it is reported, found evidence that the main thing accomplished by the dust bath is to remove excess oil from the feathers.¹

Apparently when the birds preen themselves they spread oil from the oil gland throughout the feathers. The amount of oil may become excessive; then the dust helps to keep it under control. I remember, some years ago, making engineering drawings on linen, which stains easily, and putting chalk dust on my hands to keep the perspiration under control. Now I find that birds have been using the same method for a long time.

It is interesting to notice that it is just during wet weather, when no dust would be available to remove the oil, that the birds would need oil the most.

This is likely a small matter. But does it not tell against evolution? Are we to suppose that, a long time ago, some birds happened to fall in the dust frequently, and that they and their offspring, because of the advantage of having excess oil removed (if there be any advantage to it; that does not seem to have been established), survived? Such a notion would surely be too silly even to call for comment.

So evolutionists have no answer to the question, how the birds came to take dust baths; just as they have no answer to any other question of origin to which anyone really wants to know the answer. But there is no difficulty at all in believing that God created the birds with instincts suited to their way of life, and that one of those instincts was the instinct to take dust baths.

A Dilemma of Two Diverse Resin Eaters

Everyone agrees that animals are, in some sense, adapted to their environment. For those who believe in creation and teleology this is to be expected. Evolutionists try to explain the matter somehow, by "survival of the fit"; but it has been pointed out that many difficulties arise.

If, just to mention one, two kinds of animals live in a very special environment, but differ widely in their adaptation, it is hard to see how such a state of affairs could have evolved. For surely the two kinds are not exactly equally fit; according to evolution theorists, one kind should have survived, but not the other.

If, on the other hand, it be said that slight differences in fitness do not matter, then the whole Darwinian argument fails. For nobody maintains that great differences in fitness arise spontaneously, all at once, just where they are needed.

There is a rather curious example of such differences in adaptation. The larvae of certain insects, Diptera and Lepidoptera, live in and eat the resin of certain conifers. Some of the insects, such as the *Evitria resinella* and *Laspeyresia zebeana*, seem to have no special adaptation to the resin. Others, such as the dipterans, have special spiracles, to keep clear of the resin, and special digestive processes.² Yet all of the kinds thrive.

Rapid Variation within the Kind

Although "survival of the fit" is not emphasized so much nowadays, the theory of evolution seems to require something of the sort. Some kinds survive, others do not. It would surely be difficult to deny that those that survive are "fit"; although to put the matter this way is to reduce the whole notion to a tautology.

The weaknesses of the theory have been pointed out here and elsewhere from time to time. It may, however, be worth while to notice that considerable variations may come about both in plants and in animals; but vast ages are not required, and the extent of the variation is limited.

Aphids are a useful illustration. Of the aphids, which live on plants and suck the juices, some have wings and some have not.³ Under certain conditions, the number with wings will increase. The conditions include crowding; change (usually for the worse) in the quality of food; and shortening of the days. These are all conditions under which it would be advantageous for the aphids to fly off and colonize other plants; and, of course, that is what happens.

It is said that in some cases even developing nymphs already born may develop wings. Moreover, not only do present conditions affect the issue; but the proportion developing wings seems to be greater the more of their predecessors, for about four generations back, had wings.

Two things may be noticed here. Millions of years are not involved; certain changes in the aphids occur very quickly. Of course, the same is true in the breeding of plants or of animals; if it were going to take ten thousand generations to accomplish any results, nobody would try. In fact, changes can come about quite quickly; but they are limited. The aphids remain aphids; they do not become butterflies. Just so, the many

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breeds of dog have been developed in a relatively short time; and they are all undoubtedly dogs.

The fact that the aphids are affected by factors that influence about four generations is interesting. While the point is not made very clear, presumably if a fifth generation, say, having an unusually high proportion with wings, were to live under conditions in which the wings were no great advantage, in a few generations they would revert to the original proportions of winged and wingless. In fact, there would be a reversion to type.

In the breeding of hybrid corn, or of sugar beets, it appears to be possible to improve for about four generations; then the capability for change in one particular direction has been about exhausted. Now in Scripture, we find three or four generations often set down as a limiting time, as in Exodus 20:5, and in Deuteronomy 23:7 and 8.

Apparently any change that is going to come about will occur in three or four generations or so. This, of course, fits in with the Scriptural notion of created kinds, and limited variability within a kind; but it is utterly opposed to the theory of evolution, which is based on supposed unending variation.

Aristotle, Empedocles, and Whales

It is surprising how many of the notions, which have been proposed in the last century or so as the last word of evolutionary science, actually go back to the philosopher Empedocles, who lived about 450 B.C. Empedocles' own works have been lost, but we know something about his theories from the comments of other ancient writers.

Aristotle⁴ remarked that Empedocles held that water animals had originated on land, and then subsequently moved to the water. Aristotle criticized the notion. But we know that it has been revived in modern times, both directly and in reverse.

As for the direct form of it, there is the notion that whales and such animals originated on the land, and at some time moved into the water. The reverse form, of course, holds that fish came onto the land and became reptiles.

Objections to both of these notions have been mentioned in the *Quarterly* from time to time. As for the whales, one objection is that otters, e.g., practically live in the water, but have never turned into fish-like animals. Why, then, should the (proto-) whales do so? Again, eels come out of the water quite often, and cross large stretches of land. But they have never "evolved" into anything else.

Arctic Ice and Recent Post-flood Glaciation

Bernt Balchen, a flyer and explorer who has spent much time in the Arctic, reports that the region is becoming warmer and the ice melting. Thus, it seems possible that the Arctic may become an open ocean in twenty to forty years.⁵

Does this not fit in well with the creationist view? The ice age, whatever it was, must have come during or after the Flood; had it been earlier few traces would have been left. Likely the great amount of cloud, which would have been present during the Flood, reduced the amount of heat received from the sun.

The loss of the canopy, too, could have had an effect. There may have been enough cooling, even during the Flood, that some of the water fell as snow; and there may have been much ice floating on the water, especially at the higher latitudes.

If, at the conclusion of the Flood, the land was raised, the water remaining behind as oceans, there must have been much sliding and scraping of the ice. Under these conditions, as much could happen in months as would take many years under the action of glaciers as we are familiar with them now.

The warming, then, and melting of the ice, has continued, although there well may have been fluctuations. But if we are to consider the present warming as part of the recovery from the ice age, as also many uniformitarians do, in view of the speed with which we know that the warming can come about, it seems reasonable to suppose that the ice age (again, whatever exactly it was), was at most a few thousand years ago, rather than many tens of thousands.

Post-flood Mountain Building Versus Plate Tectonics

In geology, for the last few years, the notion of plate tectonics, along with drifting continents, the spreading seafloor, etc., has received much attention. While these things have been associated mainly with uniformitarian theories, it is not necessary for creationists to discount them utterly.

It is quite possible that some such things happen, in the relatively quiet periods of the history of the earth's crust, i.e., between Creation and the Flood, and after the Flood. But we shall find it hard to believe that such processes, proceeding at a slow rate, have had a very great part in bringing about the present configuration of the earth's surface; for there has not been time enough.

In fact, new evidence may be accumulating to show that too much has been ascribed to processes of this sort. For instance, it has been pointed out that the model in terms of plate tectonics

does not fit in at all with the actual configuration of the Peruvian Andes.⁶

Here is a field in which creationists could do some more work. We can see that the ranges of mountains, as well as many other features, may well have been formed at the end of the Flood, when the continents were raised, and the beds of the oceans lowered. Scripture suggests that something of that sort happened, but gives few details. Would it not be worth while to see how much detail can be filled in, by careful study of the actual structure of the mountain ranges and the other features?

Radiometric Estimates in Jeopardy

As is well known, attempts to deduce the ages of things from the ratios of the amounts of radioactive isotopes, or the products of the decay of radioactive elements in them, have been applied to minerals which have always formed a part of the earth, and also to meteorites. Results were usually supposed to indicate something having to do with the age of the universe.

Some recent investigations have shown that such attempts must be viewed with much caution, to say the least.⁷ It is found that there are discrepancies in the results; discrepancies which do not seem to be the kind of thing that could have come from contamination from the ground. In some cases, for instance, the discrepancies were in the opposite way to what should have been caused by contamination.

The conclusion is "... that the whole of the classical interpretation of the meteorite lead isotope data is in doubt, and that the radiometric estimates of the age of the earth are placed in jeopardy."

It might be remarked that if such determinations for meteorites, which presumably have had a relatively simple history, are unreliable, how much less could one depend on the results from samples of the earth's crust; when no one knows what forces may have been operative there in the past.

Interstellar Gas and Imagined Age

It is suggested that some recent studies, made by methods of radio astronomy, reveal a huge ring of interstellar gas, which is expanding from a center somewhere in the vicinity of the solar system.⁸ The expansion is suggested to have started about 60 million years ago, and possibly to have been the result of a "super-nova," in the vicinity of the solar system.

This matter is mentioned for the following reason. If some huge catastrophe did indeed take place in the vicinity at the time proposed, surely it would have affected the earth so profoundly that any relics of earlier times would have been destroyed, or rendered meaningless.

Indeed, it might be questioned whether anything could have lived through what would have happened in the vicinity of such an explosion. Thus, if one follows uniformitarian principles, and sets the explosion at the time proposed, he should doubt whether the methods of geologists and paleontologists can give any reliable information about earlier times.

A creationist, on the other hand, is not troubled at all. He does not believe that the ring of gas, or anything else in the created universe, is 60 million years old. The ring of gas, if, indeed, such is the correct interpretation of the observations, is just another of many features created with an apparent age.

Antarctica as a Model for Mars

It may be that we shall find some of our best evidence for the interpretation of creationism in Antarctica. Already it appears that the sheets of ice have been building up for only a few thousand years. Another investigation, of some interest to creationists, has been reported.⁹

There are certain "dry valleys," especially in South Victoria Land. These are free of ice, because there is so little precipitation. The mean temperatures are about -20°C to -25°C ; even in summer the air is not much above 0°C , although the ground may reach 15°C .

The soil in these valleys was commonly found to be quite sterile, there being no bacteria. Authors of the article were interested especially in making a comparison with conditions on Mars. As they said, "Mars is more hostile (to life) than the Antarctic ... life in the Antarctic has been unable to discover a ... mechanism (by which to live) ... martian life could not be built on a terrestrial model. ..."

For some time now, creationists have been saying that it is unlikely that there are living things on Mars.

Another point might be made. Certainly bacteria from outside are constantly being carried into these valleys, in one way or another. But they have never become adapted or "evolved" to be able to live under such conditions. Now if so simple and rugged an organism as a bacterium cannot evolve to meet such conditions, is it likely that a more complicated organism could evolve into another to meet new conditions; a fish into an amphibian, for instance?

As for the hint that there might be life on Mars on some model other than terrestrial, if such a thing could come about on Mars, why not in these valleys where the conditions are admitted to be much better? But in fact, no different kind of life has arisen in the valleys. Therefore it is likely that none has arisen on Mars.

Cosmological Chaos

While discussions of the "big bang" vs. the "steady state" continue in cosmology, it is rarely noticed, or, at least, admitted, that either theory really is inadequate to explain the universe as it exists.

The big bang would presumably scatter material about everywhere; while no reason seems to have been advanced to show why atoms of hydrogen should appear from nothing where they happen to be needed, rather than everywhere at random.

For instance, it is a fact that there are binary stars, visual ones (i.e., which can be seen to be binary with the help of a telescope), as well as the more obscure ones. Some investigations, by consideration of Roche densities, show that two neighboring stars, as close as these are typically to each other, could not have formed from the cloud in the way proposed.¹¹

In this article, this difficulty is met by proposing that the stars formed at much greater distances, and then moved closer together. But, of course, there is no evidence to show that any such thing ever happened. So it would seem fair to say that uniformitarian theorists are unable to explain formation of these stars, on the basis of what is actually known about them.

Incidentally, it is pointed out in the article that the process by which the star was supposed to form from the cloud would not work for something so much smaller as a typical planet. A different sort of process has to be imagined.

Is this not the way in which the uniformitarian theorists so often go? They start out with great plans to explain everything on one principle, or in terms of one process. Then, as things are investigated more closely, one case after another turns out to need a special treatment. So in time the reader is left, not with a unified theory at all, but rather with a whole series of special cases, and *ad hoc* treatments of them.

So while either of these theories might suffice to explain why there was gas or dust more or less

uniformly distributed, were that what needs to be explained, they have little to say as to why the universe exists with features as we know it. On second thought, these theories would not even explain a featureless universe, were there one.

As for the steady state, or "continuous creation," it is no explanation to say that it happens thus and thus, without giving any reason. Nor is the "big bang" logically in a much better state. For either the bang is to be taken on faith, as it were, or else it is to be explained in terms of some previous state of affairs.

But if the first alternative is to be chosen, why try to go back to the bang? Why not just take the universe as we know it as something given? Whereas the second alternative clearly would go on forever without ever reaching its goal.

Of course, it is apparent to anyone that, even if these things do explain the material of the universe, they do not explain its features. There have been attempts to have turbulence, often introduced in some vague way, bring the material into some kind of arrangement. A recent study¹⁰ has shown that the turbulence is much less likely to cause the desired result than some have supposed.

The treatment is rather involved, but the result is that there is none of the proposed schemes of turbulence that does not run into difficulties. Whereas it is fair to say that creation does not really run into any difficulties caused by itself—if there are any difficulties they come entirely from unwillingness to accept the simple and God-given solution to the question.

Binary Stars, a Dust Cloud Dilemma

As is well known, the current uniformitarian notion on how to form a universe is to start out with a huge cloud of gas or dust, which is then supposed to gather into stars and planets. It is easy to say some such thing in so many words, but any attempt to work out the details runs into many difficulties.

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BOOK REVIEWS

Genesis in Space and Time by Francis A. Schaeffer. 1972. Inter-Varsity Press, Downers Grove, Illinois. 167 pages, \$2.25.

Reviewed by John C. Whitcomb, Jr.*

In the wide spectrum of currently popular approaches to the early chapters of Genesis, this little book will be placed far to the right of center, almost in agreement with authors who have been defending a recent and literal creation week and a universal flood. To the present reviewer, this is indeed a refreshing sign that true Biblical creationism is making a strong impact upon the evangelical world at large.

After a helpful analysis of the false alternatives to Biblical creationism (pp. 15-24), Dr. Schaeffer launches into his first attack upon uniformitarianism. The "Big-Bang Theory" is rejected (pp. 28 f); harmony is said to have prevailed in the entire world before the Fall (pp. 62-64); no animals died before Adam and Eve (p. 105); the Flood was geographically universal (pp. 133-134); catastrophism rather than uniformitarianism is the key to earth history (pp. 136-139).

The book is not a chapter by chapter commentary on the Book of Genesis. Rather, it is an apologetic for the scientific historicity of the first eleven chapters of Genesis in a day when much of Bible history has been lifted entirely out of the realm of "space and time" into an existential "upper story" of suprahistorical (and therefore essentially *non-historical*) "otherness." For one who really wants to know what God says to us in Genesis, philosopher-theologians like Soren Kierkegaard are of no help (p. 110).

Brief but stimulating discussions are presented on the image of God in man (pp. 46-52); the decision, fall, and sinfulness of Adam and Eve, and God's curse upon them (pp. 81-101); the genealogies of Genesis 5 and 11 (pp. 122ff and 154ff); capital punishment (p. 146); and the Tower of Babel (p. 153).

Unfortunately, the book is not without theological and hermeneutical flaws. For example, the discussion of "differentiations" in Genesis 1 is somewhat perplexing (pp. 37-39), as is also the artificial distinction between the verb "created" and apparently synonymous statements in Genesis 1 (p. 38).

Also, in the light of Genesis 3 and Hebrews 2:8c, can we say without strong qualification that

man still exercises dominion in the earth (p. 50)? And can we really be sure that Satan fell before man was created, in view of Genesis 1:31 (p. 62)? And does Scripture say anything specific of a "covenant of works" (p. 105 f)?

Furthermore, is it not possible that mammoths were frozen during the early phase of the Flood year as a result of the sudden collapse of the vapor canopy with the consequent permanent loss of surface heat at the polar regions (p. 139)?

The most serious error in the book, in the reviewer's opinion, is the concession that the days of creation were not necessarily literal days (p. 57), even though the author cautions that we do not "have to accept the concept of the long periods of time modern science postulates" (p. 156). Genesis 5:2, he states, does not mean a period of 24 hours when it speaks of "the day when they were created" because "it is clear that Adam and Eve were not created simultaneously"!

But what does Dr. Schaeffer mean by this? That 10 or 12 hours was too short a time for Adam to name the animals between his own creation and the creation of Eve?

But this type of objection betrays the common tendency of interpreting pre-Fall Adam in terms of our own fallen nature and limitations. Under *ideal* conditions, could not God have brought before Adam all the *kinds* (not varieties) of *birds* and *beasts of the field* (not reptiles, amphibians, insects, and sea creatures—Gen. 2:19) within a 12-hour period? And with an unfallen mind fresh from the Creator's hand, could not Adam have quickly grasped the basic characteristics ("gave names to") of these creatures?

Do we *have* to assume that the entire procedure was bogged down by the typically modern combination of sluggish wills and dull minds and inefficient methods? To ask such a question is to answer it. No, the surprising variety of Biblical evidences for literal creation days must not be set aside by the assumption that Adam would have required as much time as we would require for naming the animals.

In spite of these criticisms, the reviewer believes that *Genesis in Space and Time* will be welcomed by most creationists as a helpful and basically dependable work. It will doubtless have wide influence in the student world as a testimony to the historicity of the early chapters of Genesis, including a literal creation and fall, and a geographically universal Flood.

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The Exodus Problem and Its Ramifications. A Critical Examination of the Chronological Relationships Between Israel and the Contemporary Peoples of Antiquity by Donovan A. Courville, 1971. Crest Challenge Books. Loma Linda, California. Two volumes, I: xx + 331; II: xi + 356.

Reviewed by Erich A. von Fange*

The thesis of this investigation is that Egyptian chronology is in error by 600 years, and that synchronisms now commonly accepted are not as secure as supposed. Courville accepts the date of 1445 B.C. for the Exodus vs. a now widely accepted date in the thirteenth century. Proposed corrections yield a history of the ancient world which the author holds to be internally consistent and which confirms the accuracy of the Scriptures as an historical document (I:103).

While Courville may well be in error in details, and while he does not pretend to solve all problems involved in the matter, the evidence he offers from both Biblical and extrabiblical sources in support of his thesis deserves careful study.

Only when one begins to consider the implications for Old Testament studies of this "correction" in ancient chronology does the real problem emerge. If Courville is essentially right, the life work of hundreds of the most eminent scholars and many thousands of scholarly books and learned articles must be disregarded in large measure. This of course is more than enough to make the work highly controversial.

The problem of ancient chronology is a massive one, but it must be re-examined. Anyone with even cursory acquaintance with ancient history knows something of the discrepancies, conflicts, mysteries, and anomalies in attempting to unravel the threads of a consistent chronology.

Over the years a commonly accepted Egyptian chronology has been developed, and many of the events in the ancient world have been calibrated according to it. A great deal of the Old Testament has been questioned and even discarded because it does not fit. Ehrich (1954) probably represents as well as anyone the fruit of more than a century of the most painstaking and excruciating effort of dedicated scholarship to outline an uneasy consensus on ancient chronology.

E. F. Campbell (and others as well) have noted that "the more one studies the intricacies of the chronological problems in the ancient Near East, the less he is inclined to think of any presentation as final." Yet few if any scholars are inclined to think in terms of the thesis proposed in this work.

It is a curious fact, however, that the present Egyptian chronology is justified in the literature on the basis of such criteria as the following: (1) the well-established reputation of the scholar, (2) that the system has been much used in textbooks, or (3) that it is a sort of conventional dating system. One would hope for more than that.

To mention the name of Velikovsky in scholarly circles has been the "kiss of death" ever since his first publication in 1950. Those who respond to evidence, however, instead of emotion, have discovered important new insights into the mysteries of ancient history.

Courville does not enter into the debate on Velikovsky's astronomical theories and differs with him in the treatment of Egyptian dynasties. At the same time, Courville acknowledges his debt to Velikovsky on a number of key points in his restructuring of ancient chronology.

At present scholars wrestle with three chronologies: (a) that given in Scripture, (b) the conventional Egyptian chronology, and (c) the various Bronze and Iron Ages. The fit between any two of the three is not a good one, and generally Scripture has been "the loser" in the attempt to synchronize ancient events. Serious students must face up to some basic problems and dare to consider other possibilities than those presently offered.

As presently viewed, there is not a single incident in Scripture which is unequivocally linked with the history of Egypt prior to the 9th Century B.C. How does one view the strange silence in Scripture regarding Egypt during the period of Joshua and the Judges when Egypt presumably was a strong power during this time? Was the time of the Exodus a trivial event not worthy of notice, or was it the overwhelmingly crushing series of events described in Scripture? Better answers are needed than the ones presently offered.

In the first volume, Courville identifies many discrepancies between Scripture and events in Egypt and elsewhere in the Middle East. As a result, he points out, many have abandoned the concept that Scripture is historically reliable and consider that much is myth and legend. He argues that one must grant the possibility that there is a fundamental error in Egyptian chronology. Every position and argument in the literature regarding the Exodus event is critically examined.

Further difficulties are examined, including the Negeb, Joshua and the conquest, Jericho, Ai, the Amarna letters, Hittite chronology, the problems in synchronizing the archaeological ages and Egyptian chronology, pottery dating, the period of the Judges and the surrounding nations, the Canaanites and the Israelites, the crucial problem of who copied whom, and the origin of Hebrew

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writing. Scripture and archaeology simply do not support each other as presently dated. Courville demonstrates the beautiful fit that occurs when the ancient chronology is corrected. Scripture need not be eroded into myth.

In Volume 2, Courville examines the chronologies of other peoples of the ancient world in light of his proposed structure. Of pivotal importance is his detailed discussion of why in his opinion the dating methods in current use are invalid. Numerous sites in Palestine are discussed in the context of his thesis.

In a work of this scope, there are shortcomings. His treatments of the Flood and of Babel are certainly open to question. These discussions do not contribute directly to his thesis and should better have been omitted. The possibility of catastrophic events occurring at the time of the Exodus is better treated elsewhere.

The so-called Dorian invasion is a profound problem and mystery in its own right and could well have been omitted from this work. While one would like to see a detailed index, the task would have been formidable.

The topical index, however, is invaluable for reference. Proofreading was not carefully done.

The vast scope of the work leaves the author open to many possibilities of error in details. The reviewer is not qualified to pass judgment on the manner in which the Egyptian dynasties have been treated to accommodate his thesis. Other solutions may be equally plausible at various points in the chronology without damage to his thesis.

Too much is at stake to respond to Courville's thesis with polemics, hysteria, or ridicule. In the scholarly world, the issue he raises can and should be settled by a thorough study of the evidence presented and by new evidence brought to bear on the problem.

It is important to say that the whole point of the matter would be missed if one were to seize upon some detail that may be in error and then assume that the thesis is thereby destroyed. Only one incontrovertible fact would be needed to undermine the entire thesis.

By the same token, it would take only one such fact to undermine the entire present generally accepted chronology. After this book went to press, the British Museum, London, reported that it had dated organic material from Tutankhamen's tomb in the 9th century B.C. vs. the conventional date in the 14th century B.C.

No one should minimize the problems inherent in radiocarbon dating, but if further evidence of this nature is forthcoming, Courville's thesis may be essentially correct, regardless of errors he may have made along the way. One must be cautious about naively accepting what one wants to believe. On the other hand scholars more than once have been dragged, "kicking and screaming," into accepting solid evidence which unhappily overturned previously accepted views. The history of scholarly study is full of sorry examples of both.

If Courville is essentially correct, the historical accuracy of Scripture is strongly supported. More than that, we will have inherited a wealth of extrabiblical materials which will illuminate Scriptural events, e.g., Joseph, the famine, eyewitness accounts of the plagues and of the Hyksos invasion, the visit of Sheba to Solomon, the sacking of Solomon's temple, a solution to the crucial problem of who copied whom, and much more.

Courville deserves a thorough hearing. The best service both foe and friend of his thesis can render is to come up with the incontrovertible fact that will either support his thesis or force a revision.

LETTERS TO THE EDITOR

The Bible—Translation or Mutation?

In the Sept., 1967 issue of *C. R. S. Quarterly* 4(2):75-80, two rather obscure translations were reviewed but in the last several years, two "new" Bibles have appeared on the market and have reached the reading public. Dr. Raymond rightly challenged the translators of the New Jewish Version and the Anchor Bible for changing "In the beginning God created" to "When God began to create the heaven and the earth." But since the two more recent Bibles are being more widely read, they present greater potential danger than either the New Jewish Version or the Anchor Bible.

Translators of the New English Bible (NEB) claim that it is a completely new translation in which "biblical" English has been avoided. This version is generally acknowledged as being the result of liberal bias, I believe, and therefore is not as dangerous as the second—a paraphrase known as The Living Bible (TLB). I feel the Christian public should be warned about these so-called translations, particularly as they pertain to the area of interest of our society (although other theological and translation errors might be pointed out as well.) Gen. 1:1-3 is rendered as follows:

(NEB): In the beginning of creation, when God made heaven and earth, the earth was without form and void, with darkness over the face of the abyss, and a mighty wind that swept over the surface of the waters.

(TLB): When God began creating the heavens and the earth, the earth was at first a shapeless, chaotic mass, with the Spirit of God brooding over the dark vapors. (This paraphrase by Ken Taylor definitely shows a bias toward the pre-existence of matter and perhaps theistic evolution and is worse in Gen. 1:1 than NEB.)

Both of these renditions seem to use the elements from the New Jewish Version and the Anchor Bible, that were critically reviewed and analyzed in the Sept. 1967 article (CRSQ) by Dr. Raymond—each translation undercuts the doctrine of *ex nihilo* creation.

An interesting revelation by the translators of NEB is made in Gen. 6:14: "Make yourself an ark with ribs of cypress; cover it with reeds. . . ." (One is tempted to believe that the translators were influenced by "Ra's" voyage as described in the Jan. 1971 National Geographic although the translating was done previous to this!)

The NEB's most biased remark must be found in Gen. 11:1: "*Once upon a time* all the world spoke a single language. . . ." In Gen. 5:1 Ken Taylor writes, "Here is a list of *some* of the descendants of Adam." (Emphasis is my own).

Yours in Christ,
Ralph Swanson
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Sasebo, Japan 857-11

Dr. Leakey: Valuable Contributions

It was with real sadness that I recently read an obituary for Dr. L. S. B. Leakey. He was, of course, a staunch evolutionist and did much to promote the evolutionary cause through his understanding of fossil hominids and his untiring work at Olduvai Gorge in East Africa. Yet, if it were not for the work of this man the view of creationists with regards to these fossils would be considerably different than at present.

I once had the privilege of hearing Leakey speak and was very impressed by his sincerity and desire to come to an understanding of what the hominid fossil material really meant. Through the years he was willing to alter his analysis and beliefs as new data was presented and was continually in search for that data. In other words, Leakey was a scientist searching for meaning, and was in the forefront of the field both in theory and practice.

As a creationist, and therefore opposed to the theoretical constructs of Dr. Leakey, I sincerely appreciate the valuable contributions that he made as a scientist and fellow anthropologist. Regardless of our theoretical beliefs, we must face the facts, for it is from the facts that the theories of a discipline develop. The facts in this field of investigation are the fossils which have been brought to light throughout the world. The interpretation of the facts, however, brings a diversity of opinion and theory.

It is impossible to discuss the hominid fossil material without mentioning Dr. Leakey, for probably more than any other single individual he has promoted interest and brought to light a wealth of skeletal materials both through his own work at Olduvai and his encouragement of fellow scholars. Without this effort it would have been much more difficult to develop a rational theory which counters the evolutionist's view of the fossil record^{1, 2} and the effects of that view in relation to modern populations.³

This is not to say that we in the creationist camp have solidified our theories and have the final answer; nothing would be more dangerous. I believe, as Leakey, that we must be open to presentation of new data, and be willing to alter the details of our views as new material is brought to our attention.

I personally have benefited much from the work of Dr. Leakey and would like to thank God for a man who influenced me and made me think. Without his contribution in field work and the recovery of fossil material, and his many articles and books as well as lectures, both the evolutionist and creationist view points would be missing a vital chapter in the development of current knowledge and resulting theory. May we as an organization give thanks for such a one as Dr. L. S. B. Leakey.

References

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R. Daniel Shaw
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Expression of Regrets

I just received the information that Mr. James Austin Baker passed away today after a brief illness. Mr. Baker had been secretary-treasurer of the El Paso Chapter of the Creation Research Society during all the time of the writing of the Biology Textbook. He was also one of the authors of the book.

He had been Plant Quarantine Inspector-Plant Pathologist with the U. S. Department of Agriculture, Agricultural Research Service, Plant Quarantine Division, El Paso, Texas for many years. He is survived by his wife and one daughter.

The El Paso Chapter is establishing a James A. Baker Memorial Fund in honor of Mr. Baker. We will certainly miss him. He was a very dedicated Christian and a strong member of the Creation Research Society.

Sincerely yours in Christ,
Tom Barnes
2115 N. Kansas St.
El Paso, Texas 79902
February 5, 1973

Thorns and Thistles

The article by John R. Howitt in the June issue of the *Quarterly* was of especial interest to me in that it borders on my own specialty of nutrition through herbs.

However, there is something in his article which I do not quite understand. He says that the presence of thorns and thistles in plants are a reflection of the curse as a result of the fall of Adam.

He illustrates this by the "fact" that thorns and thistles only "appear" in the Pleistocene, "That is at the time when man first appeared." This appears as if he accepts the evolutionist time series, with Eden quite late.

However, I was under the impression that the fossil and "prehistoric" series we have all dates from the Flood. This was after the Fall, so it should appear that thorns and thistles should already have begun to make their appearance in the antediluvian landscape.

His reference to animals having the faculty of speech before the Fall was very intriguing, and one I had never heard before. Shades of C. S. Lewis and the Talking Beasts of Narnia! However, on sober thought, doesn't the faculty of speech require intellect—which is an attribute of the human soul and not shared by animals?

Seems to me he is on delicate theological ground here. I think the assumption has usually been that the talking serpent in Eden was a case

of demoniac possession: that the serpent was possessed by Satan who spoke through it ventriloquantly.

It might be that the author of the article or some readers might have some more clarification on these points.

Sincerely,

(Mrs.) Mary R. Carse
Hinesburg, Vermont 05461

Alcoholism and Nutrition

Year after year I have had much benefit from the *Creation Research Society Quarterly*, even though the technical language and data often go over my head. The high level of scholarship and documentation makes it possible to hand copies of the *Quarterly* to people not informed on the creation approach. For this I have often thanked you and your coworkers in spirit, even though not by letter; that comes when one finds something to complain about. So now, I wish to discuss the article, "The Science of Nutrition in the Light of the Scriptures," CRSQ 9(1):51ff by Dr. John Howitt. The article does not carry out its stated objectives in a way that meets the standards of the publication.

In the opening paragraph the reference to Isaiah 40:6 is unfortunate. The substance of the inspired statement has nothing to do with the derivation of biological flesh; it speaks of the non-permanence of people.

In the same paragraph, I doubt that reference to the "millennial reign" (as though it were a universally accepted reading of Scripture) has any place in a scholarly article.

In the following section, on the effects of the Curse, the writer's apparently intended point is not clear. I take it he is trying to say that what before the Fall was wholesome food, in some cases, became unusable as food.

Similarly, the connection of a discussion on vestigial organs with the stated subject of the article is obscure.

The mention of nutrition and alcoholism leads to a larger issue. This subject has been thoroughly researched and definitively reported by Dr. Roger J. Williams in his book *Alcoholism: The Nutritional Approach* (University of Texas Press 1959).

At this very point, however, a *sequitur* of creationism enters the picture. Translating Dr. Williams' findings into creationist language, one notes that the Creator has given us resources for coping with alcoholism in what the atheist calls "nature": the "disease" alcoholism results from deficiencies in certain God-given nutrients, or

from faulty assimilation thereof; which, when supplied in the abnormally large quantities required by the alcoholic, will erase, or at least decrease, his problem.

The fact that Scripture identifies alcoholism as sin means, as the writer correctly perceives, that it is *both*, sickness and sin. Treatment will therefore require a double approach: when the nutritional resources provided by the Creator have done their blessed work, the victim must still say to himself, to God and to people, "I have sinned." Intelligent nutrition and repentance yoked together yield the optimum result.

The subject of alcoholism, of course, opens the door to the much broader sin-or-sickness ambivalence which confuses both public and scientific discussion on many vital issues.

In each case, the science of nutrition throws light on basic causes of these aberrations and the physiological corrections that must be made; at the same time, violation of divine Commandments is also involved, so that all-around treatment involves spiritual recrudescence along with diagnosis and treatment via nutrition science.

I believe the CRS would do well to launch research, and compilations of extant studies (like that of Dr. Williams cited above) to explore and present facts relating to human health from a creationist viewpoint. Eventually, I see such an initiative turning into a related society. Said society, in turn, might be only the first of others devoted to specific creationist applications.

Had the defects in the Howett article been the only thing to discuss, I probably would not have written. He has probably done us all a service in opening the lid on a type of subject that may bring forth new vistas of action for the CRS.

Sincerely,
Louie Helmstetter
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Denver, Colorado 80211

Curse Until the Kingdom?

With reference to John R. Howitt's article in the *Creation Research Society Quarterly*, June 1972, volume 9 (1) pp. 51-53 I should like to point out that Genesis chapter 8, verse 21 records:

And the LORD smelled a sweet savour; and the LORD said in his heart, I will not again curse the ground any more for man's sake; for the imagination of man's heart is evil from his youth; neither will I again smite any more every thing living as I have done.

Surely this contradicts John R. Howitt's statement that the "curse will remain upon the land until our Lord returns to establish His Kingdom."

I should like to hear the author's views on this matter.

I should also appreciate hearing the author's views on the God-given food laws recorded in Leviticus (chapter 11) and Deuteronomy (chapter 14).

Yours in Christ,
Dr. A. J. 'Monty' White
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Watford Park Estate
Caerphilly, Glam
United Kingdom

Reply by Dr. John R. Howitt

Regarding the question of drinking I purposely avoided any suggestion of telling people what they should do. But to me the answer is perfectly clear and simple. I am not sure that I can accept the modern thesis that alcoholism is a disease like arthritis or diabetes. In a brief paper like mine one could not, of course, cover the entire field or even touch on the voluminous literature on the subject of alcoholism.

I cannot agree on your correspondent's interpretation of Isaiah 40:6. I think the text means just what it says. His objection to my references to the millenium may be valid, but I did so with my eyes open. I am well aware of the increasing acceptance of amilleniumism these days, but to me that position is impossible. I did not wish to offend or argue with those who accept this view so I simply stated my own position for what it was worth.

I think that the inclusion of this matter was legitimate and proper in order to complete the picture. The curse most certainly applied to both animal and vegetable life and I think that the suggestions I have made are quite legitimate.

In regard to Mrs. Carse's remarks I hesitated to introduce the geological references. I do not accept in any way at all the evolutionary time scale but I felt that there was some corroborative evidence in these findings that was of interest. The thorns and thistles certainly appeared immediately after the expulsion from Eden.

Regarding the faculty of speech in animals, it certainly does involve intellect on their part and some animals are very intelligent. Animals have souls and spirits. See Lev. 17:11 and Ecc. 3:21. The word translated "life" in Lev. 17:11 is the Hebrew word for "soul."

The idea of Satan speaking by ventriloquism through the serpent has been suggested before, but I think it would be simpler to assume that the serpent spoke on its own in the same way that

Peter did, although our Lord instantly recognized who had prompted him to do so. (Matt. 16:23)

In regard to Dr. White's question I would say that the proof or sign that the ground was cursed was to be manifested in the appearance of thorns and thistles. And, since the thorns and thistles are still with us, it would only be reasonable to suppose that the curse still lingers on.

That curse remains, but in Genesis 3:21 God promised that He would not again curse the ground for man's sake nor would he destroy every living thing as in the flood. Although God will never destroy all mankind with another flood, the damage done by the flood was not repealed. There was no restoration of life to those who perished.

Concerning the food laws of Lev. 11 and Deut. 14, my position is that, as believers, we are not under the law and this applies to all but the

moral code in the decalogue. The food laws are, however, very valuable and wise and are applicable today as a matter of health and hygiene. There is also spiritual truth in the separation of the clean from the unclean.

I believe also that they involve scientific truth as well. The cleft in the hoof, for example, is, I have been told, an excretory organ. If the animal were bitten by a snake or touched poison ivy, the toxins would be eliminated through this channel thus making the flesh fit to eat. With pigs raised in modern ways these dangers are, of course, remote and therefore the prohibition against eating pork is less imperative.

Yours in His service,

John Howitt
Apt. 1609, 19 Lascelles Blvd.
Toronto 7, Canada

CREATION RESEARCH SOCIETY

History The Creation Research Society was first organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creationism, with a current membership of about 400 voting members (with graduate degrees in science) and over 1300 non-voting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and is now recognized as probably the outstanding publication in its field.

Activities The Society is solely a research and publication society. It does not hold meetings or engage in other promotional activities, and has no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund is maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible.

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$7.00 (Foreign, \$8.00 U. S.) per year and may be sent to Wilbert H. Rusch, Sr., Membership Secretary, 2717 Cranbrook Road, Ann Arbor, Michigan 48104. Sustaining membership for those who do not meet the criteria for voting membership, and yet who subscribe to the statement of belief, is available at \$7.00 (Foreign, \$8.00 U. S.) per year and includes subscription to the Annual Issue and Quarterlies. All others interested in receiving copies of these publications may do so at the rate of the subscription price for all issues for one year: (\$10.00 (Foreign, \$11.00 U.S.).

Statement of Belief Members of the Creation Research Society, which include research scientists representing various fields of successful scientific accomplishment, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms.

We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. In 1970 the Society published a textbook, *Biology: A Search for Order in Complexity*, through Zondervan Publishing House, Grand Rapids, Michigan 49506. All members of the Society subscribe to the following statement of belief.

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.

2. All basic types of living things, including man, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

3. The great Flood described in Genesis, commonly referred to as the Noachian Flood, was an historic event worldwide in its extent and effect.

4. We are an organization of Christian men of science who accept Jesus Christ as our Lord and Saviour. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Saviour for all mankind. Therefore, salvation can come only through accepting Jesus Christ as our Saviour.

APPLICATION FORM FOR THE CREATION RESEARCH SOCIETY

Four Groups can receive our quarterly publication. They are:

- 1) *Voting Members:* these shall have an earned degree in some recognized area of science at at least the level of the master's degree (M.A. or M.S.)
- 2) *Sustaining Members:* these are people with or without advanced degrees in an area other than science, who are interested in the work of the CRS.
- 3) *Student Members:* these include high school and undergraduate college students, who wish to become acquainted with the work of the Society (CRS).
- 4) *Subscribers:* these include all libraries, schools, churches and other organizations, as well as any individuals who wish to know what the Society (CRS) is doing, but who feel that they cannot sign the statement of belief. Organizations, by their very nature, cannot sign statements of belief.

In addition, all members (categories 1, 2, and 3 above) must subscribe to the following:

1. The Bible is the written Word of God, and because we believe it to be inspired thruout, all of its assertions are historically and scientifically true in all of the original autographs. To the student of nature, this means that the account of origins in Genesis is a factual presentation of simple historical truths.
2. All basic types of living things, including man, were made by direct creative acts of God during Creation Week as described in Genesis. Whatever biological changes have occurred since Creation have accomplished only changes within the original created kinds.
3. The great Flood described in Genesis, commonly referred to as the Noachian Deluge, was an historical event, worldwide in its extent and effect.
4. Finally, we are an organization of Christian men of science, who accept Jesus Christ as our Lord and Savior. The account of the special creation of Adam and Eve as one man and one woman, and their subsequent Fall into sin, is the basis for our belief in the necessity of a Savior for all mankind. Therefore, salvation can come only thru accepting Jesus Christ as our Savior.

(tear off and return)

MEMBERSHIP APPLICATION BLANK

I fully subscribe to the Statement of Belief of the CRS as stated above, and submit my application as one of the following:

- () Voting Member; dues \$8.00/year (\$9.00 foreign)
() Sustaining Member; dues as above.
() Student Member; dues \$4.00/year (\$5.00 foreign).

Since I do not subscribe to the Statement of Belief (or represent an organization):

- () Subscriber; dues \$11.00/year (\$12.00 foreign).

My membership should begin with the June 19____ copy of the Annual Issue, since the publication year begins in June and continues through September, December and March.

Name_____Street_____

City_____State_____Country_____

Zip_____Phone_____Degree_____Field_____

University granting degree_____Year_____

Presently associated with_____

Please complete this blank and return with the proper remittance to the membership secretary:

Wilbert H. Rusch, Sr.
2717 Cranbrook Rd.
Ann Arbor, Mich. 48104
Phone 313 - 971-5915

Please make out checks to the Society (CRS). Please DO NOT send cash.